ARCHIVES OF OPHTHALMOLOGY.

A CASE OF FAVUS OF THE UPPER LID.

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(*With two figures on Plate VI. of Vol. XXXVII., German Edition.*)

Translated by Dr. Ward A. Holden.

IN the literature there are but four cases of favus of the lid recorded; we can now report a further case.

E. B., a servant, aged twenty-two, came to the clinic on February 9, 1898, on account of an affection of the right upper lid, giving the following history:

She awoke January 21, 1898, with a feeling of burning in the right eye, and on looking into a mirror discovered two small yellowish-red vesicles, which were slightly painful to the touch. Two days later the vesicles united and grew larger, causing great pain.

The patient is well developed and of healthy appearance. The lateral half of the right upper lid is occupied by a dry, fissured crust (Fig. 1). It measures 19 × 10 *mm*, and overhangs the lid margin below, without, however, being attached here, the lid margin being free. The lashes are not involved, but as the lid has a slight tendency to entropium they are turned downward. The crust is sharply limited from the surrounding skin, and with it is freely movable over the tarsus. Near the crust the skin is reddened and swollen for a distance of 2–3 *mm*. The crust is elevated 1.5–2 *mm* above the surrounding level. The surface is uneven and in its upper-middle portion shows a long, deep excavation, which the remainder of the crust surrounds like a picture frame, broader below. The excavation is filled with a white, powdery mass which has assumed the appearance of a netlike veil. The color of the crust is for the most part sulphur-yellow; yet there are transitions from a color almost white to a sepia brown. The crust

is not painful when touched, but there is at times spontaneous pain of a burning character. Inward and upward from the crust, in the tarso-orbital fold, are some reddish vesicular efflorescences with pale, transparent contents.

The whitish masses in the cavity of the crust were examined microscopically in glycerine. They proved to consist almost entirely of sporidia of the Achorion Schoenleinii—round or elongated yeast-like formations 2.5–4 μ long, each containing two or more light points (Fig. 2). Many of these formations lay isolated, while others were grouped into chains of various lengths. The eyeball itself is not involved. R V = $\frac{5}{5}$, not improved by glasses.

The therapy consisted in applying an oiled compress in the evening, and when this was removed the following morning the entire crust came away, and frequent washings with bichloride 1 : 4000 soon led to definite healing.

The appearance of the crust, its color ranging from yellow to brown, its dryness, and its whole aspect left no doubt but that we had to do with a case of favus, and the diagnosis was confirmed by the microscopic examination. Culture experiments with portions of the crust in bouillon were unsatisfactory, because by the third day colonies of other micro-organisms were so numerous that a separation could not be made. Many others have had a similar experience in trying to obtain pure cultures of the favus micro-organism.

We could obtain no definite idea as to the manner of infection in our case. The patient did not recollect having been near any one affected with the disease, nor had the cats and chickens which the patient fed shown any signs of disease. The house in which she lived was overrun with mice.

Although a direct transference of the fungus could not be proven in this case, it could not be definitely excluded, and according to analogy in all the cases reported, in which the etiology was referred to, it is the most probable explanation. On the other hand, one might believe that the infection had occurred through germs in the air, but it would be hard to explain why only the lid had become infected.

Quincke[1] reports one case of favus of the upper lid in a

[1] *Monatsheft f. prak. Dermatologie*, vi., 1887, p. 983.

woman in good circumstances who had mice in her bedroom, but whether the mice were diseased or not was not discovered. The same author reports another case of favus in which it was suspected that the infection had taken place from mice, and one mouse affected with favus was caught. So the inoculation may have been caused by a mouse directly, or by the patient touching objects on which the micro-organisms were present and then rubbing the lid, or through the medium of insects.

The first of the four cases previously observed was reported by Narkiewicz-Jodko, in 1869. A Hebrew, aged forty-eight, presented a crust on the upper lid of the left eye, 2½ *cm* long and 1½ *cm* broad and 2 *mm* thick. The crust had the same characteristics as in our case, and masses of the Achorion were found.

Arcoleo discovered in a case of favus capitis spores and threads on the lashes and the hair of the head.

Professor Schiess reported in detail, in the year 1873, a case of favus of the upper lid in a girl of thirteen. A yellowish-white dry crust covered the nasal half of the upper lid. The crust was excavated in its centre and contained dry yellowish-white masses, which consisted of favus fungus spores.

Hardy, in 1885, demonstrated a case of favus of the upper lid.

In Arcoleo's case the affection of the lid was secondary, and involved only the lashes, while all the other cases of primary favus of the upper lid have presented the same typical picture: a whitish-yellow, dry, fissured, sharply limited crust on the upper lid; it is movable with the skin over the tarsus; it is not painful to the touch; the subjective symptoms are slight; the disfiguration of the face is the more marked because generally the remaining skin of the face is not affected. The affection has a benign character; the cause is destroyed by mild disinfectants; since the skin affection does not extend deeper than the epithelium no scar results, and there is complete *restitutio ad integrum.*

The purpose of this paper was to fix the typical appearance of this affection both in description and illustration.

My thanks are due to Professor Mellinger for his kindness in allowing me to use the case.

Explanation of the Figures of Plate VI.

Fig. 1. A favus crust on the upper lid of the right eye, drawn from life.

Fig. 2. Some forms of the spores from the crust shown in Fig. 1. Leitz cc. 4, obj. 7, length of tube 20 *cm.*

EXPERIMENTAL INVESTIGATIONS ON THE PATHOGENESIS OF CHOKED DISC.

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THE introduction of the ophthalmoscope greatly increased our knowledge of many conditions which previously had passed under the general names amaurosis or amblyopia; and especially in affections of the brain and cord we know that particular fundus lesions are produced in each case, so that a glance at the fundus often enables us to diagnose the central disease. Among the symptoms which accompany all diseases with increased intracranial tension is choked disc.

Graefe in 1850 found choked disc without exception in a number of patients who died later of brain tumor. This association was not a chance one, he thought, and although he could not demonstrate an anatomical connection between the changes in the brain and those in the optic nerve he sought to explain the development of choked disc as follows: The brain tumor presses directly, or indirectly by increased intracranial tension, upon the cavernous sinus, which must cause congestion in the veins of the retina. This congestion manifests itself in dilatation and tortuousness of the vessels, and the passive hyperæmia leads to œdema of the disc and later to proliferation of tissue. These pathological changes have an irritating effect and may bring about an inflammation of the disc and the neighboring portions of the retina.

Gradually all these changes produce atrophy of the optic nerve if the patient does not previously die of the brain tumor.

According to Sesemann, and Schwalbe, however, this theory is untenable. Sesemann found that the venous blood of the eye usually, through the medium of anastomosing vessels, could pass readily into the facial vein, while the central vein of the retina often emptied not into the cavernous sinus but into the ophthalmic vein. An obstruction of the venous circulation within the cranium could not, therefore, have much influence upon the venous circulation in the eye.

Schwalbe in his studies on the lymph circulation of the eye proved that the subarachnoid space was in direct communication with the subvaginal space of the optic nerve so that any liquid injected into the cranial cavity passed directly to the eyeball. Schmidt, repeating Schwalbe's experiments, observed further that the liquid in cases of increased intracranial tension passed into the lamina cribrosa and formed there a fine network, compressing the nerve fibres and thus causing an œdema and later an inflammation of the papilla—choked disc.

Schmidt tried to explain the fact that frequently there was no choked disc in cases of brain tumor, but a simple atrophy, by supposing a direct compression of the trunk of the nerve by the neoplasm. In such cases the communication between the subdural and subvaginal spaces would be broken.

Manz's investigations threw more light upon the etiology of choked disc. By the injection of various liquids, such as water, defibrinated blood, glycerine, mercury, and solution of Berlin blue, he sought to increase the intracranial tension and study the disc both clinically and anatomically. His results were as follows: The cerebro-spinal liquid flows directly in the subvaginal space of the optic nerve to its entrance into the ball. Here its farther flow is checked and an ampulla-formed dilatation of the subvaginal space results, while the nerve and its vessels are compressed. This compression causes first a venous hyperæmia of the fundus and later choked disc.

Benedikt believed that the development of choked disc could be explained otherwise. Various intracranial diseases are usually associated with vasomotor disturbances which manifest themselves not only in the brain but also in distant parts. Therefore the choked disc and the neuro-retinitis are merely symptoms of a vasomotor disturbance dependent upon a pathological innervation of the sympathetic.

Loring's theory was similar. Choked disc in his opinion arises because certain centres or nerves in the brain are compressed which regulate the blood circulation and nutrition of the disc and optic nerve.

Parinaud's explanation is as follows: Since the optic nerve is a direct continuation of the brain substance, its lymph vessels must be intimately connected with those of the brain. A lymph stasis or œdema of the brain, such as is commonly observed in cases of brain tumor, is necessarily followed by a lymph stasis in the vessels of the optic nerve, and if long continued this leads to choked disc. The subvaginal space plays no rôle in the production of choked disc.

The origin of choked disc thus remained an open question until Leber and later Deutschmann advanced the so-called "inflammation theory." Both authors sought to prove, partly by clinico-anatomical observations, partly by experimental investigations, that increased intracranial tension alone never produces choked disc. The latter develops only when the cerebro-spinal liquid contains certain phlogogenic substances. The nature of the substances is unknown, but they may be products of metabolism as, for example, in cases of brain tumor. When the tension is increased these substances pass more readily and quickly into the subvaginal space, but increased tension does not play the chief rôle in the production of choked disc.

Schultén obtained quite different results. A number of experimental investigations in regard to brain tension and choked disc led him to the following conclusions: When the intracranial tension in the rabbit reaches 40–50–60 *mm* Hg., the excavation of the optic nerve becomes smaller as seen with the ophthalmoscope, the arteries

thinner, the veins wider, so that veins previously invisible now become perceptible. When the tension reaches 100–120 *mm* Hg., all the vascular changes become more exaggerated, the arteries scarcely perceptible, the veins dark red. When a tension of 40–50 *mm* Hg. is maintained for 2–4 hours, the fundus changes persist for many hours thereafter. The following day the fundus is normal again. Similar changes are seen in the beginning of choked disc in man. We can, therefore, definitely maintain that choked disc arises from compression of the central vessels in the optic nerve due to increased intracranial tension.

Thus we see that Manz and Schultén on the one hand, and Leber and Deutschmann on the other, have tried to solve this question experimentally and have arrived at quite different results, so the question may still be considered open.

Adamkiewicz stands quite alone with his theory. "The so-called choked disc," he says, "is the result and visible expression of a neuroparalytic inflammation caused by pathological irritation of the centres of the optic nerve and those governing its nutrition, the inflammation extending along the nerve to the papilla."

An increase or a diminution of the brain pressure occurs because within the unyielding bony walls of the cranium are the brain which cannot change in volume and the cerebro-spinal liquid whose quantity is subject to great variation from many different causes (v. Bergmann).

We know from physics that the volume of liquid bodies can be but slightly changed by pressure. The most intense pressure will reduce the volume of water only 0.000064. The thicker the liquid the less the possibility of reduction, and the brain must have a smaller pressure coefficient than that of water. Thus, when in our experiments we were sometimes able to inject 3 *cc* of water into the cranial cavity, the cerebro-spinal liquid must have been forced out. The liquid about the cord and that about the brain form a single system, and according to hydraulic laws an increase in pressure at any particular point must be followed by an increase throughout the entire system and uniform pressure upon the brain and its surrounding membranes.

Since the sheaths of the optic nerve are continuous with those of the brain, a slight increase of tension will drive the cerebro-spinal liquid into the subvaginal space. At the same time there will be a compression of the capillaries of the brain, the blood will be forced out of them, the nutrition of the brain will quickly be disturbed, and the various respiratory and circulatory disturbances ensue. According to Bergmann, the amount of blood circulating in a time unit is reduced a half when the diameter of the capillary is reduced $\frac{1}{10}$, and is reduced to $\frac{1}{10}$ when the diameter of the capillary is reduced $\frac{1}{3}$.

In this way the brain in the first case receives only half the normal blood supply. A slight increase of intracranial tension in the rabbit causes no changes in respiration or pulse in the course of the first 6–8 hours, but ophthalmoscopic signs of compression of the central vessels are already manifest.

In our experiments dogs and rabbits were used. The anatomical structure of the fundus and the course of the nerves and vessels in these animals differ from those in man. In the rabbit the optic nerve on its way to the ball bends sharply downward and then passes almost directly upward, runs along the ball, and penetrates its coats again bending downward. The length of the first descending portion is about 4 *mm*, and of the ascending about 5 *mm*. The vessels perforate the sheaths of the nerve and enter its substance close behind the sclera. The disc presents a deep physiological excavation, abrupt at the nasal side, sloping at the temporal. The papilla is surrounded for a distance of $2\frac{1}{2}$ disc diameters by medullated nerve fibres. Since the nerve sheaths yield readily, the circulation and disposition of the liquid passing from the subdural space to the tortuous subvaginal space must take place earlier than in the human eye. Furthermore, the central vessels in man enter the nerve 1 *cm* behind the ball and are therefore compressed over a longer course than the vessels in the rabbit which enter the nerve immediately behind the sclera. Therefore, following Deyl's theory that the compression of the vessels takes place chiefly at the point where they

perforate the nerve sheaths and enter the nerve, the compression must occur earlier in the rabbit than in man. On account of the presence of medullated fibres, the beginning of œdema of the disc is less readily recognized than in man.

The eye of the dog is more similar to that of man. The optic nerve runs almost in a straight direction to the ball, the vessels enter 4–6 *mm* behind the sclera. The upper half of the disc is often bordered by medullated fibres, while below the fundus resembles that of man. Notwithstanding the advantages of the eye of the dog, all experimenters have used rabbits.

An increase in intracranial tension may be produced, first, by introducing into the cranial cavity various substances which, gradually increasing in size, force out the liquid contents of the cranial cavity, and, second, by forcing indifferent liquids into the cranial cavity under a pressure which exceeds the intracranial pressure.

The skull is trephined and a rubber balloon 1 *cm* in diameter is passed either above or beneath the dura and filled with salt solution through a tube, never more than 1 *cc* being injected within twenty-four hours. The distended balloon blocks the wound in the bone and the external wound is sutured and covered with iodoform collodion. In some cases bits of laminaria 0.8–1.5 *cm* long were introduced.

A better method in which a uniform tension can be maintained is to open the skull with a trephine 3.5 *mm* in diameter, divide the dura, and screw in a canula with a cock, connecting this by a rubber tube with a funnel filled with physiological salt solution. A height of the surface of the solution above the skull of 13 *cm* corresponds to 10 *mm* of mercury. A pressure of 80 *mm* of mercury kills a dog in less than twelve hours. Morphine is injected subcutaneously before the experiment is begun.

The animal was decapitated and the entire head hardened in 4% formalin for a week, after which the skull and the orbits were opened, the optic nerve cut close to the optic foramen, and the eyes enucleated. The hardening was then continued in alcohol, and the eyes and nerves were im-

bedded in celloidin. One was cut in frontal sections, the other in sagittal, and the sections were stained by Van Gieson's method.

FIRST EXPERIMENT.

A dog weighing 12 *K.* Muriate of morphine 0.1 injected subcutaneously. Trephined to the right side of the sagittal suture at the highest point of the skull. The dura was torn and a canula screwed into the wound, which was connected with a column of colored physiological salt solution corresponding to a column of mercury 30 *mm* high. After opening the cock of the canula the central veins became dilated at once and the arteries contracted. The eyeballs from time to time rotated inward and upward; half an hour later there was swelling of the disc, particularly at the margins. The central vessels appeared as before. The experiment lasted eight hours. Four hours after it began the eyes were rolled in and up to such an extent that an ophthalmoscopic examination was impossible. Therefore the canula was removed and the wound in the skin closed with three sutures. After fifteen minutes, the ophthalmoscope could be used. The retinal veins were dilated, the arteries contracted, the margins of the disc blurred, the disc itself œdematous.

Autopsy.—The dura was hyperæmic, the pia hyperæmic only near the wound. Much of the India ink used to color the injected liquid was found on the pia over the entire surface of the brain, on the base, and about the medulla. The substance of the brain was anæmic. The sheaths of the nerve were distended, particularly near the ball. Much India ink was found in the subvaginal space, particularly near the ball. The contents of the skull was 90 *cc.*

Microscopic Examination.—The subvaginal space dilated. In the optic nerve and the surrounding cellular tissues many cells were found, in greater number near the bulbar end of the nerve. The central vein was overfilled with blood. At places the fibres were loosened so that spaces appeared among them. There was a great increase in the number of cells found in the supporting connective tissue of the

nerve. The papilla projected about 0.2 *mm* as compared with a normal papilla; its nervous elements were pushed apart and infiltrated with round cells. The veins were greatly dilated, overfilled with blood, and there were even extravasations. The œdema extended to the retina and was particularly well marked in the layer of rods and cones.

SECOND EXPERIMENT.

A dog weighing 17.8 *K.* Morphine 0.2. Trephining and pressure of 40 *mm* of mercury made. After fifteen minutes, contraction of arteries and dilatation of veins. After an hour, the papilla was œdematous particularly at its margins and the vessels appeared arched. After eight hours, all the symptoms more pronounced. The eyes were turned up and in; the conjunctiva was slightly œdematous. Respiration was reduced to 16. After twelve hours, the œdema of the papilla was greater. Respiration 14. After twenty-two hours, the dog was decapitated and the head placed in 4 % formol.

Autopsy.—The dura and the pia exhibited deposits of India ink and the pia was hyperæmic. The lateral ventricles were dilated and granules of ink were found in the liquid. The nerves were stained black and the tissue in the capsule of Tenon in the left eye was stained gray. The subvaginal space was dilated.

Microscopic Examination.—The subvaginal space was widely dilated and surrounded the nerve like a ring, broader as it approached the eyeball. This was chiefly between the dural and pial sheaths, but in places the pial sheath was detached from the nerve. The sheaths were infiltrated at some points with round cells and the subvaginal space contained a fibrino-cellular exudation. The fibres of the optic nerve were loosened and separated by open clefts. The septa of the nerve exhibited a round-celled infiltration. The papilla projected 0.5 *mm* and the physiological excavation was obliterated. The veins of the papilla and retina were overfilled with blood and there had been some diapedesis of red corpuscles.

(There follow reports of 17 other experiments with practi-

cally similar results and they are therefore omitted here.—TRANS.)

The gradual development of choked disc in man is seldom followed, for while the eye-changes are among the earliest symptoms of increased intracranial tension, the subjective symptoms of the disease at first so little incommode the patient that he does not seek medical advice.

Oppenheim, who had the opportunity several times of seeing choked disc gradually develop in cases of brain tumor, describes the process as follows: "At first the fundus presents no changes, then there develops in one eye or in both simultaneously an optic neuritis, and from this there develops gradually, or rapidly in some cases, a choked disc which appears first in the eye which presented the optic neuritis first."

Leber, in Graefe-Saemisch, describes the course as follows: "Clinically the so-called choked disc is characterized by a clearly marked venous hyperæmia, narrowing of the arteries, tortuousness of the veins, and in the later course of the disease are added reddening and swelling of the papilla, blurring of its margins, and here and there hemorrhages, usually in the retina."

Falkenheim and Naunyn divide the symptoms caused by increased intracranial tension into the direct and the indirect. The former, which include the changes in respiration and circulation, arise when the pressure in the subarachnoid space comes to approximate that in the carotid, and they are the result of anæmia of the brain. Choked disc, on the contrary, which is one of the indirect symptoms, develops when the tension is equivalent to that of a column of mercury 40–60 *mm* high. Such pressure is not sufficient to cause compression of the capillaries of the brain.

Our experiments show that the experimental choked disc, as produced by increasing intracranial tension in any way, gradually develops in the following way: Even so slight an increase in tension as that corresponding to 15–20 *mm* of mercury in the dog and 10–15 *mm* in the rabbit soon causes signs of venous hyperæmia and arterial anæmia of the

retina. Vessels appear in and about the disc which usually are not visible in the healthy eye, indicating that the outflow of venous blood is impeded, resulting in an overfilling and dilatation of all the smaller veins. In the rabbit these changes can be brought about almost instantly. In dogs, however, a longer time is required for the development of the venous hyperæmia. This difference is due to the different arrangement of the vessels in the two eyes, that in the dog more nearly resembling that in man. The further changes in the fundus of the dog appear two or three hours after the beginning of the increase in tension. The papilla becomes gradually œdematous, loses its sharp outlines, projects forward, and acquires a rosy hue. After eight or ten hours the arteries and veins arch perceptibly in passing from the papilla to the retina, and they appear blurred, veiled, or even in places interrupted from the œdema and cloudiness of the tissues in which they run. Further observation is usually impossible because the animal dies.

Simultaneously with the fundus changes in all the animals experimented with there was noticed contraction of the pupil, a turning of the eyes in and up, and, toward the end, nystagmus and œdema of the conjunctiva.

When balloons or bits of laminaria were introduced the process went no farther than a transient dilatation of the veins.

As regards the changes found microscopically, it may be said in general that in every case, whether in a dog or in a rabbit, the subvaginal space was found to be dilated. The cerebro-spinal liquid passes between the dural and pial sheaths to the bulbar end of the space which ends in a blind sac. Since the intracranial tension does not diminish, the liquid distends the subvaginal space, and more excessively at its bulbar end. Thus arises the ampulla-formed dilatation which has been described by Manz, Schultén, and others.

This distension of the sheath causes at once a compression of the nerve and of its vessels.

In most cases both the vein and the artery are compressed from the point where they perforate the outer sheath up to

their passage through the lamina cribrosa. In this course the artery is empty and the vein sparsely filled. The capillaries and veins beyond the lamina cribrosa in the papilla and the retina are overfilled with blood.

Frequently we find in the sheaths of the nerve and the surrounding connective tissue an infiltration of round cells. Cells are found in the subvaginal space also, and in two cases there was a fibrino-cellular exudation in this space. In fine, the microscopic picture suggests in this respect a perineuritis.

The tissues of the nerve appear œdematous in its entire extent. The longer the experiment lasted or the higher the pressure the earlier the œdema appeared.

In the cases in which the intracranial tension in the dog was maintained at a constant height the papilla projected 0.2–0.5 *mm* forward into the vitreous. This increase in volume was due to œdema of the tissues, the liquid separating the individual fibres. The fibres themselves may be in a state of degeneration, and groups of red blood corpuscles indicate previous diapedesis. In rabbits it is difficult to produce œdema of the disc on account of the anatomical conditions.

In the animals in which a transient increase in tension was brought about by introducing bits of laminaria or a rubber balloon, the clinical symptoms were mild and the microscopic changes were not pronounced.

It now remains to settle the question as to which of the several theories offered in explanation of the pathogenesis of choked disc is most likely to be true. I shall not discuss the infection theory proposed by Leber and Deutschmann and supported by others. No one doubts the possibility of choked disc arising in certain cases after the introduction of various poisons into the body. Experimental and clinical observations teach us that undoubtedly choked disc develops at times in consequence of local irritation of the papilla and optic nerve from toxines and other poisons. I would refer to the experiments of Solowieff, who found that the introduction of the toxines of the staphylococcus aureus into the vitreous was in most cases followed by papillitis and

choked disc. Selenkowski made similar observations. Hallermann saw choked disc in a case of erysipelas of the face, Adamück in a case of retention of urine.

Although the inflammation theory is admissible for some cases of choked disc, it is not so for the majority of cases. No one has determined the presence of phlogogenic substances in cases of brain tumor, yet it is in these cases that choked disc most frequently appears. For the unprejudiced investigator the mechanical theory has more points of plausability than the inflammatory. All depends upon explaining the mechanism of the compression of the nerve and its vessels.

When we inject a liquid into the subdural space under a certain pressure, we produce a uniformly increased tension in all the tissues and organs to which this liquid has access. Usually the blood pressure in the veins is very low, but when the intracranial tension is increased to 20–80 *mm* of mercury, as in my experiments, the circulation of venous blood is impeded and likewise the outflow of venous blood into all the tissues whose blood is carried off through the sinuses of the brain.

The retina is one of these tissues. Although, according to the investigations of Sesemann and Gurwitsch, anastomoses exist between the ophthalmic and the anterior facial vein which permit the venous blood of the eye to be carried off collaterally, nevertheless a pronounced increase in tension in the cavernous sinus must have an effect upon the amount of blood in the ophthalmic vein and its branches. A certain time is required for the collateral circulation completely to take the place of the normal. We have seen, however, that twenty hours of slightly increased tension is sufficient in dogs to cause œdema of the optic nerve. It is very probable that in the slow gradual increase in tension which occurs with the growth of a tumor this factor plays a less important rôle; yet we are not justified in denying categorically its importance in the production of choked disc, as some authors do. Thus the first factor in the mechanism of the production of choked disc is compression of the sinuses of the brain, and particularly the cavernous sinus, in conse-

quence of increased intracranial tension. Then follows the distension of the subvaginal space by the cerebro-spinal liquid forced down into it. By this the central vessels are compressed in their course from their entrance into the outer sheath of the nerve to their passage through the lamina cribrosa. The result is a venous hyperæmia of the retina, and some time later an arterial anæmia, which is explained by the structure of the vessel walls, the thin-walled veins being compressed more readily than the thicker-walled arteries. The pressure of the cerebro-spinal liquid compresses all the vessels running in the nerve and particularly the network of fine capillaries in which the optic nerve is so rich.

The venous stasis and interrupted lymph circulation lead to an increased transudation of liquid into the tissues of the nerve, which again increases the compression of the vessels. In our preparations some nerve fibres were entirely surrounded by œdematous liquid, and at various points cavities and lacunæ had formed between various bundles of fibres. The vessels, particularly the veins, often were found to be surrounded by an exudation, so that in transverse section the diameter of the cavity in which the vessel lay was three times that of the vessel itself.

The changes were always more pronounced in the orbital portion of the nerve, which was directly compressed by the cerebro-spinal liquid in the subvaginal space. The changes in the nerve in the lamina cribrosa and papilla were always secondary, being due to disturbances of blood and lymph circulation in the more central portion of the nerve.

White blood corpuscles emigrate in large numbers from the vessels and form the round-celled infiltrations that we sometimes found in our preparations. The portions most exposed to the pressure, such as the outer sheath and the neighboring tissues, showed the most excessive infiltration.

Thus we see that increased intracranial tension also suffices to cause symptoms of stasis and even of inflammation in the optic nerve and papilla.

In conclusion I wish to present some clinical observations showing that with the decrease in intracranial tension the signs of choked disc vanished or became much less.

Mudd described a case in which choked disc was found in a girl of twelve, with headache, giddiness, and left-sided paralysis. On trephining, an echinococcus of the brain was found with dilatation of the lateral ventricles and pronounced increase in intracranial tension. The focus of echinococci was removed and complete recovery ensued, all the symptoms disappearing, among them the choked disc.

Sänger reported a case in which the presence of choked disc led to the diagnosis "brain tumor." Trephining was done, and no tumor was discovered, but much cerebro-spinal liquid was evacuated. The choked disc on the right side disappeared completely and diminished greatly on the left.

Bruns described a case of bilateral choked disc with headache, depression, hemiparesis, and right facial paralysis. Diagnosis: Tumor in the posterior lobe. On trephining no tumor was discovered. After the operation much cerebro-spinal liquid was evacuated and the choked disc disappeared. Later, at the autopsy, a glio-sarcoma was found in the region of the gyrus hippocampi, gyrus angularis, and posterior lobe.

Brudenell Carter in three cases of choked disc made an incision through the outer sheath of the optic nerve, and in each case not only did the vision improve and the symptoms of papillitis decrease, but all the other symptoms of increased intracranial tension vanished.

From my experiments the following conclusions can be drawn:

1. Increased intracranial tension alone is sufficient to produce choked disc. It is only necessary that this tension shall be maintained uninterruptedly for a certain time. A transient increased tension, even though often repeated, leads only to venous hyperæmia and arterial anæmia of the fundus.

2. In order to produce choked disc the tension need be increased but slightly—to 8–15 *mm* of mercury or less.

3. The eye of the dog and that of the rabbit react differently to increased intracranial tension. While it is easy to produce in the former both the clinical and the anatomical

picture of choked disc, choked disc can rarely be brought about in the latter because of the deep physiological cup and the relation of the vessels to the optic nerve. Herein lies, possibly, the explanation of the fact that different experimenters have arrived at such diverse conclusions.

4. The first clinical sign of increased intracranial tension seems to be the changes in the retinal circulation—dilatation of the veins and constriction of the arteries.

5. The nearer to the eye the vessels perforate the sheath of the nerve, the earlier the changes in the retinal circulation appear.

6. In the production of experimental choked disc probably several succeeding factors are of importance. First the increased tension leads to compression of the venous sinuses of the brain, which disturbs the venous circulation in the eye. Then is added the stasis of liquid in the subvaginal space and the compression of the vessels in their course from their passage through the nerve sheath to the papilla. Finally the nerve itself is compressed by the disturbed circulation in its own lymphatics; with the latter begins the œdema of the nerve fibres, which in turn increases the compression of the vessels. Such disturbances in the blood and lymph circulation, when continued for a certain time, lead to inflammatory manifestations in the nerve, its sheaths, and the papilla.

7. In view of the similarity in anatomical construction between the eye of the dog and that of man, the results of my experiments can with considerable reason be supposed to hold good in man also.

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ABSTRACTS OF THE ARTICLES IN VOL. XXXVI. OF THE GERMAN EDITION OF THESE ARCHIVES NOT PREVIOUSLY TRANSLATED.

By Dr. COLMAN W. CUTLER, New York.

II.—Considerations Regarding the Vision of Strabismics.

By Dr. **ALFRED GRAEFE**, Weimar.

THIS paper is controversial and deals with Dr. Steffan's criticisms of Professor Graefe's views.

The assumption that the former regarded binocular vision as innate and compulsory seems to be an error. He writes: "At every opportunity I have, on the contrary, expressed the opinion that in the final development of the binocular act, the empiristic principle, *i. e.* practice, or habit has a most important and formative influence."

The second difference depends also on a misconception.

"Steffan explains the single vision of strabismics by the assumption that a deviation may occur at an early period when the binocular coördination is still unstable, and thereby a tendency to the development of abnormal retinal relations of identity may be brought about, since the normal retinal identity is not innate, as was formerly believed, but acquired like binocular vision, so that the former is a product of the latter."

Graefe agrees with this, but does not consider that it wholly explains the single vision of those with strabismus. The cause is more often dependent on what he has called regional exclusion, which is explained fully in his work, *Das Sehen der Schielenden*, Bergmann, Wiesbaden, 1897.

III.—Double Homonymous Hemianopsia.

By Prof. **MANZ**, Freiburg.

The case published by Foerster, in 1890, under the title, "Ueber Rindenblindheit," aroused great interest among neurologists and ophthalmologists, as it touched some of the most important points in the physiology of the senses as well as in psychology.

Two phenomena in the clinical picture seemed to give it an especial completeness: the retained small, central field, with the loss of both half fields and the loss of orientation in space. That the latter cannot depend on the narrowed field of vision, as might be supposed, is shown by the fact that the defective or lost orientation is manifest, not only in the uncertain movements of the patient but in his images of the topographical relations of well-known places. Moreover, in certain patients of this class orientation has remained unaffected, while in others it has failed where only half the field was lost, and even with normal field.

Various attempts have been made to explain the retention of the small central area of the field. That it cannot depend on the association of this area with a definite part of the cortex is shown by its varying extent and relation to the point of fixation. Two other explanations are more plausible: one, the duplicate supply of the macula lutea by optic fibres from both hemispheres; and the other, an especially favorable blood supply of that part of the cortical visual centre corresponding to the macula (floor of the calcarine fissure, Henschen).

The case here described was reported by Knies a year ago (1897), but it will be of interest to repeat the examination, because of its rarity and the possible changes in that time.

M. Johann, miller, sixty-five years of age. The large, well-built man gave the impression of great helplessness, in striking contrast to his rather good vision. The history as regards heredity and previous illness was negative. There had been no ocular disorder. The patient was somewhat alcoholic. Three years ago he noticed suddenly that he saw nothing on the right side, while

direct vision was undisturbed. There is no recollection of other symptoms at that time, and he was able to continue his business. About a year ago, as suddenly as before, he lost vision downward and to the left. At this time and previously there was no headache nor vertigo nor other discomfort. This condition remained unchanged. Since the second attack there has been an occasional weakness in the right hand and memory has failed ; this was apparent during the examination, when he was unable to tell his age although it had been told him just before. Under observation, he showed an awkwardness in his movements, dependent not so much on defective orientation as on a certain state of abstraction, so that he did little but what he was directed to do. This paralysis of will was apparent in the commonest actions, walking, standing up, sitting down, which, however, were always performed correctly at command.

The eyes externally, pupils and fundus, except for slight pallor of the papillæ, were normal. Vision = $\frac{8}{9}$ with + 1.5 D ; with + 5.5 D the smallest print was read. The fields of vision were approximately the same for both eyes, the fixation points retained, the lower halves lost, of the left upper quadrant but a small strip remained, the largest part being in the right upper quadrant. The fields for colors were correspondingly narrowed.

The physical examination and that of the nervous system showed nothing essentially abnormal, except a slight weakness of the right arm. Four weeks later his strength failed, especially in the right arm and later in the right leg, while in the left extremities there were involuntary twitchings. The eyes were turned upward and could not be moved downward, a point hard to prove in the almost unconscious state. No autopsy was allowed.

A comparison of this history with that taken a year before by Knies shows that there had been little change. The senile degeneration had advanced, memory had failed, but a loss of orientation, so-called psychic blindness, had not appeared. Central vision had altered little, but the difference in the fields was more striking. The fields taken later were larger upward and outward than those taken a year before. For comparison the two are given together.

	L. E.				R. E.			
	Up.	Up in.	In.	Out.	Up.	Up in.	Out.	In.
Knies....	10	15	10	5	10	10	10	8
Manz....	30	30 (40)	30	2	30	45	25	5

To explain this increase in the fields it may be assumed that the focus of disease had diminished in size, or that the neighboring parts had recovered from its influence.

The origin of the double hemianopsia is believed to have been a focus in each hemisphere, in nearly the same place, back of the basal ganglia, possibly in the cortex of the occipital lobe or in the corona radiata, leaving intact on one side at least the cortical area corresponding to the macula lutea.

With regard to the details of other similar cases, reference is made to the work of Knies and Brückner.[1]

The only complication or sign of extended disease of the brain was the weakness of the right hand, which only appeared after the second attack of hemianopsia, and which was at the end followed by paralysis of the right foot; this would indicate that the lesion in the left hemisphere was subcortical and advancing toward the internal capsule.

V.—Coloboma of the Macula Lutea in Both Eyes.

Dr. **KATHARINA KASTALSKY,** Moscow.

The case is that of a girl nine years of age who, it was noticed, saw badly as she began to study. The eyes appeared normal except for the remains of a pupillary membrane. The ophthalmoscope showed a white spot about 1.5 Pd. outward from the nerves, having a diameter equal to 2 Pd. in the left eye and 2.5 to 3 Pd. in the right eye.

These colobomata differed in shape and in color, the left being snow white and the right bluish. The edges are sharp and pigmented; there is pigment scattered over the floors and vessels are visible there whose origin from the choroid or sclera is uncertain. The depth of the colobomata is 3 D. Vision: R E, 0.2, improved by cylinder to 0.4; L E, 0.4.

The limits of the field for white and colors are normal, and for white objects there is no defect in the centre, but for small colored objects there is a central ring-scotoma whose contours correspond closely to those of the colobomata. In the centre of the fields there is no defect, and the margins of the ring-scotoma toward the centre are the same for the

[1] *Inaug. Dissertation*, Giessen, 1896.

three colors. The breadth of the ring-shaped scotoma is greatest for green, less for blue and red, which coincide.

According to Bock,[1] in 1893, among 33 cases, in only 3 was the change bilateral. Two theories have been offered to explain the condition: one associating it with the embryonal cleft, and the other attributing it to an intrauterine choroiditis, neither of which is entirely satisfactory.

In this paper the views of various writers are discussed, and numerous references to literature are given.

VI.—What is the Function of Brücke's Muscle?

By Dr. **VINCENZ FUKALA,** Vienna.

The writer reviews the descriptions of the ciliary muscle of Brücke, in 1847, and of H. Muller, in 1857, and of later authors, especially Iwanoff. The bundles of the meridional portion of the muscle pass backward nearly to the posterior pole, anastomosing in such a manner as to form a kind of network. The straight portion of the bundles extends only $2\frac{1}{3}$ *mm* from their origin at the corneo-scleral margin; from here they diverge and change their meridional to an equatorial direction. This arrangement convinces Fukala that the function of the muscle is not to draw the choroid forward and compress the vitreous, thus aiding the act of accommodation, as has been assumed. He believes that it prevents the distention of the eyeball and opposes the action of the external muscles, which by their pressure tend to lengthen it.

Instead of tensor choroideæ, Brücke's muscle should then be called "contractor bulbi."

This description of its function would explain Iwanoff's well-known pictures of Brücke's portion of the ciliary muscle in hypermetropia where it was found to be poorly developed, and in myopia where it is large, the opposite to the demands made on accommodation in these conditions.

VII.—Pinguecula.

By Dr. **WALTER HÜBNER,** Giessen.

As is well known, pinguecula is a misnomer, as fat does not enter into its composition. Age seems to have less

[1] *Die Angeborenen Colob. des Augapfels*, Wien.

influence on its occurrence than was thought, as it is not very uncommon to find it before the twentieth year. The site, on the exposed part of the eyeball, sometimes along the lower corneal margin, which is uncovered in looking upwards, explains its occurrence. The obvious appearance of the pinguecula under different conditions and the varying views of its histology are given at some length. Fuchs[1] has dealt with the anatomy quite thoroughly; his opinion is that there is a thickening of the conjunctiva with hyaline degeneration and the deposit of free hyalin, similar to the arcus senilis. There is also a considerable growth in number and size of the elastic fibres, unlike anything else in the eye or elsewhere.

Sgrosso asserts that pinguecula has more variety, and divides it into episcleral and conjunctival, and the latter into epithelial and connective tissue. The differences between Fuchs's results and those of Hübner are not very striking. The latter lays more weight on the part played by the connective tissue and less on the hyaline degeneration. The degeneration of elastic fibres is analogous to that in the skin described by Unna, M. Schmidt, and others. Certain interesting details of the methods of examination may be studied in the original.

VIII.—Strabismus.

By Dr. **R. A. REDDINGIUS**, The Hague.

The author offers a simple hypothesis to explain the occurrence of convergent and divergent strabismus.

There are four forms of "fixation-innervation," of which two are mentioned: convergence and divergence innervation. In binocular fixation both are present, and in the normal condition both are equal. These two forces appear to alternate in very small periods, so that the eyes are in a constant state of oscillation around the fixation point. From this simple premise the conclusion is clear: The function of binocular vision may be delayed in its development, and since this function consists of two elements, convergence and divergence, it is possible that one may be delayed more

[1] *Græfe's Archiv*, xxxvii., 3.

than the other. Could anything be simpler! The author promises a further elucidation, however.

XII.—The Cause and Variability of Corneal Astigmatism.

By Dr. **ADOLF STEIGER**, Zurich.

This paper is controversial, and is directed against an article by Dr. W. M. D'Aubigné Carhart.[1] The criticisms of the author seem to be based on a misconception, and deal in part with recognized facts concerning the use of Javal's ophthalmometer. The author then considers Dr. Carhart's conclusions, which he summarizes as follows: "The myopic process, as at the posterior pole, influences also the curvature of the cornea and gives rise to astigmatism. This opinion," he continues, "already expressed by Risley, Batten, and others, is so distinctly opposed to the facts that it requires contradiction." For the evidence the reader is referred to a previous contribution.[2]

Steiger examined the eyes of more than 2000 children between the ages of seven and sixteen years, with the following result as to the proportion of astigmatism in the three periods.

Age of boys..... girls.....	7–9 8–10	10–12 11–12	13–15 14–16	
Astig. 0.25–1.25 D.....	% 81.2	% 81.6	% 85.4	Total. 82.
1.5–2.75 D.....	15.3	15.5	11.3	15.
3. and over.....	3.5	2.9	3.3	3.

In these periods the myopia had made progress among the boys from 4 % in the first group to 7 % in the second and 13 % in the third, and among the girls from 3 % to 11 % and

[1] "The Refraction of the Eyes of One Thousand School Children," etc., *N. Y. Med Jour.*, April 17, 1897.

[2] "Astigmatismus und Schule," von Dr. Adolf Steiger, *Correspondenzbl. f. Schweiger Aerzte*, 1897, No. 10.

18 %. According to these statistics the relation between myopia and astigmatism does not exist.

XIII.—A Case of Papilloma of the Conjunctiva.

By Dr. **K. RUMSCHEWITSCH**, Kieff.

At the inner angle was a pedunculated growth, concealed by the lids, with a slender stem reaching beneath the caruncle. The greatest diameter was 5 *mm.* The symptoms of lachrymation caused by its pressure on the lachrymal points had appeared several months previously. The surface was smooth and the color pale red.

The sections resembled those of an angiosarcoma; the vessels from the peduncle divided in all directions, and were all surrounded by thick sheaths of epithelial cells, which sprang from the epithelium of the plica semilunaris. The depressions of the surface were so narrowed by the pressure of the lids that, although deep, they did not break the apparent continuity.

Although there could be no doubt that the case was a connective-tissue growth, yet the epithelium played a very important part. In all the layers of cells the nuclei were well preserved; as a rule they were quiescent, but in the more central layers, hardly ever, however, in those next the central vessels, all stages of indirect nuclear division were noted. The degree of mitosis depended on the development of the central vessels.[1]

Such tumors, often resembling polyps, which are not found on the conjunctiva, may be classified as soft or hard fibromata, papillomata, or less often sarcomata. According to Elschnig[2] and Fuchs this tumor belongs in the category of fibroma papillomatosum, after Virchow.

XIV.—The Measurement of Visual Acuteness.

By Dr. **RECHE**, Kiel.

The objections to the use of Snellen's types raised by Guillery[3] are based on the theory that the images of the

[1] Fuchs, "Ueber das Papillom der Conjunctiva," *Arch. f. Augenheilk.*, xx., p. 431.
[2] *Arch. f. Augenheilk.*, xix., p. 63.
[3] *Ibid*, Bd. 35, Heft. 4.

letters cover more space than the area of clearest vision in the retina, and his system of points is offered as a more exact method. The author holds that Guillery's system is as open to criticism as Snellen's, since the point of clearest vision cannot be estimated by exact fixation, even the smallest objects being seen by minute movements of the eye.

Formerly the entire macula was considered the area of clearest vision, then the fovea. According to Fick the diameter of the physiological centre is about 0.3 *mm*, and Guillery by a method of his own estimates it at 0.05 *mm* Reche considers it much smaller, too small in fact to measure. The recognition of points depends on their brightness and is a function of the light-sense.

The author tries to clear up some of the obscurities in Guillery's article, and concludes that his claim for the superiority of point-tests as giving an exact measure of the visual acuteness of the centre of the retina, independent of the light-sense, is unfounded.

XVII.—The Permeability of the Iris and the Lens-Capsule for Fluids.

By Dr. **ULRICH**, Professor at Strasburg.

That these tissues may serve as filters is obvious, and no doubt was raised of the possibility of fluid passing through the iris until recently Koster,[1] as a result of experiments made with physiological salt solution on the iris of fresh eyes of oxen, under a pressure of 5 to 20 *mm* Hg., concluded that filtration was not proven.

Diffusion through the iris is generally acknowledged and since, in his experiments, Ulrich used fluorescin, the diffusibility of which is relatively slight, the results show that the filtration actually took place.

In order to determine the possibility of filtration at its periphery, the iris was left *in situ* and the eye prepared in an ingenious manner, the details of which may be found in the original. The result showed conclusively that aqueous humor filters through the iris.

[1] *Graefe's Archiv*, 41, iii., p. 108.

After a brief reference to the various opinions regarding the nutrition of the lens, the author considers the forces by which its nutritive material is brought.

The physical conditions do not permit osmosis; the changes in its form during accommodation may aid in the exchange of fluid by a kind of aspiration if the lens-capsule is capable of filtration, and this was proven to the author's satisfaction by repeated experiments.

The presence or absence of the epithelium seemed to make but a slight difference.

The filtration through the posterior capsule was four to seven times as great as through the anterior capsule.

XVIII.—Investigations as to the Adaptation of the Entire Retina in Pathological Conditions.

By Dr. **LIEBRECHT**, Hamburg.

The fields of vision in seventy cases of various diseases of the retina, choroid, and optic nerve have been taken after Wilbrand's method [1] in a dark room, by means of luminous paint. The examination is made on entering the dark room and again in ten minutes, this interval being enough to enable the normal eye to adapt itself so that the field reaches the limits of a white object in daylight.

A number of typical fields are given showing delayed or deficient adaptation in chorio-retinitis, retinitis pigmentosa, detachment of the retina, retinal hemorrhage and advanced myopia, where the pigment epithelium and adjacent layers are affected.

In diseases of the optic nerve, where Treitel and others have not found adaptation disturbed, the author, by the method described, detects significant variations from the normal which enable him to state that disorders of adaptation occur in parenchymatous inflammations of the optic nerve both primary and secondary, but that they are absent in interstitial inflammation when the nerve fibres are not involved.

[1] *Die Erholungsausdehnung des Gesichtsfelds im normalen und pathologischen Zustande, 1896.*

As an example of pure parenchymatous inflammation tabetic atrophy is mentioned in which the recovery of the extent of the field in darkness is slow, the perception of light is also sluggish. A half an hour or an hour passes before the eye has recovered, so that the field is as large as it was by daylight, but it is characteristic for this condition that adaptation does not stop here, but that the ultimate field in the dark room is larger than that found by daylight. Two symptoms are noted in this connection, the fatigue symptom (Ermüdungssymptome, Wilbrand, l.c.) and the subjective dazzling in bright light. The author claims for these phenomena diagnostic or prognostic value. If with an atrophy of unknown origin there is normal adaptation we may conclude that the process has run its course, while diminished recovery in darkness indicates a progressive process.

The difference in the adaptation in simple optic atrophy and in that following chronic glaucoma, is noteworthy, the latter being much slower.

In several cases of choked disc and of neuritis and neuroretinitis in which the nerve fibres were not involved — interstital inflammation—adaptation was normal.

Retrobulbar neuritis showed a normal adaptation of the periphery, delayed in the region of the relative scotoma but defective where this was absolute.

An interesting case of multiple sclerosis in which there were large and variable scotomata as well as peripheral limitations, showed an absolutely normal field after adaptation in the dark room. This is contrasted with a case of idiopathic night blindness, in which the field was normal by daylight, while in the dark room, with the eye adapted, there was a large ring-scotoma. In the former case the optic nerve was affected, and in the latter, the retina.

The conclusions are that disorders of adaptation may occur through disease of the "secreting elements of the retina and indirectly of the centrifugal nerve fibres supplying them."

XX.—Accommodation and Field of Vision.

By Dr. **GUILLERY**, Cologne.

The influence of accommodation on the limits of the visual field was noted by Liebreich. Von Graefe was unable to convince himself that the field was enlarged during accommodation,[1] while Aubert and Foerster[2] were able to detect a considerable increase. Aubert used black objects of 20, 8, and 4 *mm* square, on a white ground, at a distance of 1000, 400, and 200 *mm* respectively. The distance of the objects from each other was equal to the sides of the squares. The angle under which they were seen was then the same for all. The largest object was recognized at 39°, and the smallest at 67°. Thus, with an increase of from 1 to 5 diopters—from 1000 to 200 *mm*—the increase in peripheral acuity was from 39° to 67°.[3]

The attempts to explain these findings, cited by the author, are not satisfactory, and later investigators find that instead of the extensive widening of the field mentioned by Aubert, it may be taken as from 1.5° to 3.5°.

The explanation generally accepted seems to have been based on experiments made on dogs by Hensen and Voelckers: on excitation of the exposed ciliary nerves they were able to demonstrate a forward movement of the choroid and retina, through a hole cut in the sclera, and a needle piercing the sclera showed with each effort of accommodation a movement of its outer end backward. When separate branches of the ciliary nerves were stimulated, only the corresponding portion of the choroid moved.

Guillery found no increase in the field during accommodation for different parts of the retina from the posterior pole forward, measured by Groenouw's method,[4] until at 70° it became apparent and increased from that point to the extreme limits.

The conclusion as to the cause is that the advance of the anterior pole of the lens is of importance, and that the movement of the choroid and retina may also be a factor.

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[1] *Arch. f. Ophthal.*, ii., 2.
[2] *Ibid.*, iii., 2.
[3] Moleschott's *Untersuchungen*, iv., 1857.
[4] *Archiv f. Augenheilk.*, xxvi., 2.

XXII.—The Dilatator Pupillæ in Man; A Contribution to the Anatomy and Physiology of the Muscles of the Iris.

By Dr. **KARL GRUNERT**, Tübingen.

The first anatomical description of this muscle was given by Valentin and Brücke, but Kölliker first demonstrated the presence of smooth muscle fibres in the iris.

While there has always been an agreement regarding the presence and function of the sphincter pupillæ, the conflict as to the dilator was of long duration. The reason for this lay in the difficulty in preparing and describing anatomically the posterior layers of the iris. Here, between the stroma and the pigment layer which forms the posterior surface, lies a layer which in radial sections appears somewhat lighter, and which has given rise to much conjecture.

In this layer many saw the sought-for dilator. Bruch,[1] its discoverer, whose name it bore, described it as a delicate, glass-like, structureless membrane. The fibrous appearance of this membrane seemed to him a delicate folding; he held that it was a continuation of the basal membrane of the choroid, which could be followed over the ciliary processes to the posterior layer of the iris. He was struck, however, by the numerous nuclei.

Henle[2] was the first to give a full description of the membrane.

It appears transparent in section, finely striped seen from the surface, and divisible into fibres. He succeeded in showing rod-shaped nuclei and in giving to the ground-substance a coloring that made it similar to the muscular sphincter, and which differentiated it from the stroma. As he succeeded in isolating spindle-shaped cells, there remained no doubt as to the muscular nature of Bruch's membrane, which Henle considered the dilator pupillæ.

Merkel[3] described definitely the relations of Bruch's or better now, Henle's membrane as a continuous muscle layer on the posterior surface of the stroma of the iris. In the

[1] C. Bruch, *Zur Kenntniss des körnigen Pigmentes der Wirbelthiere*, Zurich, 1844.
[2] *Handbuch der Eingeweidelehre des Menschen*, 1866, p. 634.
[3] *Die Musculatur der menschlichen Iris*, Rostock, 1873.

region of the sphincter, according to his opinion, it divided into two layers: one passing radially to the edge of the pupil; the other, bending forward, formed peculiar arched connections with the fibres of the sphincter, the separate bundles leaving the radial direction and becoming circular.

A number of investigators substantiated these views, to whose work reference is made at some length in the original.

The first opponent was Grünhagen,[1] who, while he acknowledged the existence of the limiting membrane lying next the pigment layer, could not convince himself of its muscular nature. He found two epithelial layers, the anterior layer containing elliptical nuclei being attributed to the pars iridica retinæ. In front of these epithelial layers Grünhagen described a very delicate, fibrillated layer, often interrupted by radial stripes, which could be followed from the ciliary margin to the pupillary edge, where it seemed to unite with the circular fibres of the sphincter. This layer was continuous with the vitreous layer of the choroid. It was separable by teasing into fine fibres, which in appearance and chemical reaction resembled fine elastic fibres and which were held together by an albuminous pigmented cement which he held for the basis of the adjacent epithelium. This thin fibrous layer he held to be identical with that described by Henle, Merkel, Iwanoff, and Huttenbrenner as the dilatator.

Schwalbe declared the second layer of epithelium to be the outer coat of the secondary optic vesicle, and embryologically the continuation of the pigment epithelium of the retina. He saw in the clear membrane described above nothing but the posterior limiting membrane in such close connection with the neighboring epithelial layer, the pars retinalis iridis, that it was with difficulty separable from it, and that cells from the latter remained attached to it, giving Henle, Merkel, and Iwanoff the impression that it was a muscular layer, the dilatator. Michel, Fuchs,[2] and Retzius[3] agreed in the main with Schwalbe.

[1] "Ueber das vorkommen eines Dilatator Pupillæ in der Iris bei Menschen und Säugethiere." *Zeitschrift f. ration. Medicin*, 1866, xxvii., p. 180.

[2] "Beiträge zur normalen Anatomie der menschlichen Iris." *Archiv f. Ophthal.*, 1885, Band xxxi., Hft. 3, p. 39.

[3] *Biologische Untersuchungen*, neue Folge v., 7. Sur Kenntniss vom Bau der Iris, 1893.

In 1894 Juler and L. Müller published methods of decoloring the pigment cells. The method of the former, devised by Griffith,[1] was by means of chlorate of potash and hydrochloric acid. In these sections of the human iris, deprived of pigment, Juler saw clearly a spindle-cell layer between the stroma and the pigment epithelium which he called the dilatator pupillæ. The origin seemed to be the junction of the iris epithelium with the epithelium of the ciliary processes, where the spindle cells seem to be attached to the ligamentum pectinatum; at their inner extremity they mingle with the sphincter pupillæ. Back of the dilatator Juler described two layers of epithelium. Müller[2] used peroxide of hydrogen.

In the course of the examination of the iris of a very blond person, the author was led to test Griffith's method, but found it unsatisfactory, because of the distortion and shrinking it produced. He continues: I employed therefore a decolorizing method recommended by Alexander Alfieri, of Pisa.[3] The eyes, halved equatorially, were hardened equally well in formalin, Müller's fluid, or sublimate. The anterior half or quadrants of the iris were embedded in celloidin. First the sections were placed in a 1:2000 solution of permanganate of potash in which they remained twenty-four hours, or less if in the sunlight. When they had become brown, they were put in a 1:300 solution of oxalic acid, in which after a few hours they were entirely decolored. The duration of both steps depends on the quantity of pigment in the tissue. After thorough washing in water the sections may be colored as desired. They are made brittle by the decolorizing solutions and take stains less readily; on this account I used almost exclusively Heidenhain's iron-alum hæmatoxylin stain.

In radial sections prepared in this manner, the first thing to strike the eye is the spindle-cell layer which lies between the stroma and the posterior epithelium. It is striking that the thickness of the spindle-cell layer is considerably greater at the periphery than toward the pupil, in opposition to the

[1] *Transactions of the VIII. International Ophthal. Congress*, p. 67.
[2] *Wiener klinische Wochenschrift*, 1895, p. 59.
[3] *Monitore Zoologico Italiano*, August, 1897.

arrangement of the iris as a whole, which is thinner toward the periphery than toward the pupil.

These spindle cells differ in no respect from smooth muscle fibres.

That they contain pigment cannot, as Retzius says, be considered an argument against their muscular nature.

This layer lies upon the stroma of the iris without a perceptible layer between them. The question arises then, where is the posterior limiting membrane which the opponents of Henle describe so minutely, now as transparent and structureless, again as finely fibrillated, but always without nuclei. The explanation of this contradiction lies in the changes of the dilatator during mydriasis andis dealt with later.

The origin of the dilatator is seen to be in the ciliary body, where the thicker ciliary portion of the muscle spreads out still in a radial direction, and the smooth muscle fibres may be followed to the pupillary margin, where they unite with the circular fibres of the sphincter. Since the dilatator was absent in none of the radial sections of the iris, it may be considered a continuous muscle layer.

The author describes a variety of sections made in different directions for the purpose of studying more thoroughly the anatomy of the iris. A number of plates, for which reference should be made to the original, make the descriptions clear and seem to substantiate the claims as to the muscular nature of the layer in question. Finally, to dispel all doubt, a specific stain for smooth muscle fibres is used. After staining as mentioned above with iron-alum and hæmatoxylin, the sections are put in a mixture of picric acid and acid fuchsin. This, differing slightly from Van Gieson's solution, consists of 3 *ccm* of concentrated aqueous solution of acid fuchsin to 100 *ccm* of picric acid solution.

In this the connective tissue is first bleached and takes the red of the acid fuchsin, then the protoplasm becomes yellow from the picric acid, while the nuclei still keep their black and dark brown color. The muscle fibres alone are yellow. If Henle's membrane consisted of connective-tissue fibres, it would be stained red with acid fuchsin.

In general, the posterior epithelium of the iris is in a single layer. On passing to the ciliary body, however, it becomes double; in place of the large, polygonal, irregular cells, there are two regular layers, of which the lower, like the iris pigment, is strongly pigmented, while the superficial layer is made up of cells of cylinder form, without pigment. With regard to the presence of muscular fibres in the stroma of the iris, the author finds them scanty, and arranged in the walls of the larger arteries as elsewhere. In the pupillary region, near the sphincter, he found radial fibres leaving the circular bundles and passing outwards towards the periphery.

The connection between the sphincter and the dilatator consists of connective-tissue processes, in part muscular, passing obliquely from one to the other. Differing from other investigators, the author classes these strands with the sphincter. The reason for this is that in sections of a contracted iris, with narrowed pupil, these connecting strands seem to be shortened so that the dilatator and pigment epithelium are drawn forward almost in contact with the sphincter, forming a circular depression or groove on the posterior surface. This is evident in the author's plates and indicates that the sphincter is attached by radial fibres to the posterior layers of the iris and especially to the dilatator.

By the insertion of the radial fibres of the sphincter in the dilatator, the appearance and disappearance of the pigment margin during the changes in the size of the pupil is explained.

There is a considerable difference in elasticity between the anterior and posterior layers of the iris. The anterior portion, composed of the endothelium and the loose stroma, is not as extensile as the posterior layers, especially the smooth muscle fibres and epithelium.

Moreover, the connection between the posterior layers and the ciliary body is looser, especially during myosis, when the vessels of the iris are full, and those of the ciliary processes less filled, than is that of the anterior layers with the ligamentum pectinatum.

This traction of the sphincter on the posterior layers is

not exerted on the pupillary margin, but at the point where the oblique fibres reach the dilatator. The portion in front of this insertion is relaxed, and since during myosis the limit of extensibility of the anterior layers is reached first, this portion is pushed forward and drawn out at the same time by the relative traction of the anterior layers backward, and ectropion of the pupillary margin, not alone of the pigment layer, is produced.

In mydriasis, on the other hand, the ectropion iridis disappears and the oblique connecting fibres are relaxed, which proves that the dilatator is attached to the pupillary margin and not to the periphery of the sphincter, and that the connecting fibres belong entirely to the sphincter. They do not serve, however, to increase the force of the pupillary contraction, as Grünhagen has stated, but fix the peripheral margin of the sphincter and flatten the whole muscle during its contraction.

Eversbusch[1] assumes the existence of such fibres as an explanation of the existence of slit-shaped pupils in certain animals. They occur there on opposite sides, fixing the ring-muscle and drawing the pupil lengthwise.

During mydriasis, the iris is emptied and the ciliary processes filled with blood, the posterior chamber is flattened and the peripheral part of the dilatator becomes more distinct. According to Juler, its fibres bend forward to the ligamentum pectinatum and serve when they contract to close the spaces of Fontana.

While at rest, during myosis, the dilatator shows the same histological characteristics as other smooth muscle fibres. There is seen during contraction a peculiar but undoubted separation of the elements forming the smooth muscle fibres into two layers where formerly there was only one, a layer of fine fibres towards the stroma and of rod-shaped nuclei towards the epithelium. The anterior layer is probably the posterior limiting membrane mentioned previously and described by Grünhagen and others who do not believe in the existence of a dilatator. The author believes that the nuclei and fibres are part of the same muscle layer, and that their

[1] *Zeitschrift für vergleichende Augenheilkunde*, iii Jahrgang, 1885.

differing relations depend in some way on the state of activity or rest of the muscles. That the fibres are always towards the stroma may depend on the close connection between them, while the nuclei during contraction are crowded toward the epithelium, the direction of least resistance.

It is probable, then, that those who have described this fibrillary layer as a separate membrane have examined eyes in which the pupil was dilated, while Henle and his adherents who found only one layer of spindle cells between the epithelium and the stroma have studied preparations with narrow pupils—that is, with a relaxed dilatator.

L. Müller[1] reached a conclusion very similar to this in examining eyes treated with eserin and atropin respectively.

The claim, that the muscular fibres in connection with the vessels may suffice as a dilatator, requires little attention. The larger arteries have a muscular coat, but those of medium and smaller calibre have none.

A consideration of the deficient muscular tissue in the walls of the arteries of the iris, which is in contradiction to the prompt contraction of the vessels, makes the dilator not only a physiological but an anatomical necessity.

The remainder of the article consists of a brief statement of conflicting theories which add little to our knowledge and are apart from the purpose of the author, whose conclusions are stated as follows:

1. The human iris possesses a layer of smooth muscle fibres lying between the stroma and the posterior epithelium, which by its anatomical arrangement and conduct during the changes of the pupil must be regarded as the dilatator pupillæ.

2. This muscle has its origin in the connective tissue of the ciliary body and is inserted at the pupillary margin.

3. It is identical with Henle's membrane and with the spindle-cell layer of Grünhagen as well as the posterior limiting membrane.

4. The posterior limiting membrane is a phenomenon dependent on the contraction of the dilator.

[1] *Wiener klinische Wochenschrift*, 1895, p. 59.

5. The connecting fibres passing obliquely from the periphery of the sphincter to the dilatator are to be regarded as the insertion of the sphincter, which serves to flatten it during its contraction.

6. The posterior iris epithelium is, in adults, in one layer and corresponds in height to that of the ciliary processes.

7. Because of the deficient muscular tissue in the walls of the vessels of the iris, the dilatator assumes the function of a vasomotor.

FIG. 1.
(See p. 386.)

FIG. 2.
SARCOMA PROTRUDING THROUGH THE CORNEA.

A CHOROIDAL SARCOMA PRODUCING RUPTURE OF THE CORNEA IN AN UNUSUAL MANNER.[1]

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(*With two photographs on Text-Plate III.*)

THE following case presented at least one feature so unusual that we have deemed it worth reporting.

W. F., male, sixty-four years of age, entered the Massachusetts Charitable Eye and Ear Infirmary on March 14, 1900, during the service of Dr. B. Joy Jeffries, to whom we are indebted for the privilege of reporting the clinical history of the case. The patient stated that about five hours before coming to the Infirmary, while quietly talking with his wife, he was suddenly taken with a severe pain in his left eye, from which there immediately followed a profuse hemorrhage. On putting up his hand he found the eye bulging, or, as he expressed it, he thought the "eye was coming out."

The previous history given by the patient showed that he had been myopic from childhood, and that his eyes had given no trouble until August, 1897, when he noticed for the first time that the vision in his left eye was gradually beginning to fail. His vision continuing to grow worse, about two and a half months later he applied for treatment at the Carney Hospital, where he

[1] Read before the New England Ophthalmological Society, Dec. 4, 1900.

was told that he had partial separation of the retina. He was advised to remain in the hospital for treatment, but as he was suffering no pain he did not accept this advice. Aside from the poor vision, his left eye gave him no trouble until about two months later when he was suddenly attacked with a severe pain in the same eye and left side of head. After enduring the pain for a week he applied for treatment and was admitted to the Infirmary. The diagnosis of secondary glaucoma was made, the history not stating, however, what was suspected as the primary condition. During his stay at the Infirmary he had a severe glaucomatous attack which did not respond to medicinal treatment. Enucleation was advised, but the patient refused to submit to an operation. He remained in the Infirmary ten days. The pain lasted about one week after his discharge, when the eye became perfectly comfortable.

For two years after this his eye was absolutely free from pain and he was able to attend to his business, that of a cigar peddler. About five weeks previous to the time we saw him the left eye again became inflamed and painful, the onset of this attack being ascribed to exposure to cold and wind. The pain was similar to that which he had in his first attack. After suffering from the pain for one week he was seen in the Out-Patient Department of the Infirmary. The eye presented the appearance of glaucoma and the cornea showed complete yellowish infiltration. Enucleation was again advised, but he again refused. Pain of varying intensity continued up to the day before entrance, when he suffered an especially severe attack. This attack lasted during the night, subsiding towards morning, the eye finally becoming quite comfortable. It was at this time that occurred the sudden attack of pain and hemorrhage already mentioned.

Examination showed a well developed man, looking somewhat pale and apparently weak from the loss of blood. A dark red, somewhat pear-shaped mass, with slightly roughened surface, was found protruding from the corneal region of the left eye. This mass is well shown in the accompanying photographs (see Figs. 1 and 2 of Text-plate III). The cornea was apparently completely torn away from the scleral attachment, and a portion of it could be seen incorporated in the mass on the inner side near its base. The projecting mass measured about 3 *cm.* in length, 2 *cm.* in

its widest part. It was apparently formed for the most part of blood clot. A slight hemorrhage was still taking place from around the corneal margin. The provisional diagnosis of intra-ocular hemorrhage, with rupture of cornea secondary to glaucoma or new growth, was made, and an immediate enucleation advised. Under ether a simple enucleation was done by Dr. Spalding. The eye was removed without much difficulty, with the projecting mass intact. The scleral portion of the globe presented nothing abnormal, nor was the nerve sheath apparently distended. The orbit was searched for any sign of extraocular growth, but none was found. The orbit healed quickly and the patient was discharged apparently well.

Pathological Examination of the Enucleated Eye.—Externally the eye presented nothing abnormal except the ruptured cornea. After hardening in formalin, the eye was sectioned in an antero-posterior vertical plane passing just to the temporal side of the optic disc. The microscopic appearance of the sectional eye is very well shown in one of the photographs. The interior of the globe as well as the mass projecting from the ruptured cornea appeared to consist entirely of clotted blood. Within the area artificially marked off in the photograph by a white line were to be seen some irregular markings, lighter in color than the surrounding mass, which at first were taken to be strands of separated retina. Examination of the other half of the eye, which was the portion used for making microscopical preparations, seemed to bear out this assumption, for in this the markings appeared to be connected with the optic disc. The eyeball, as will be seen from the photograph, was not distorted, due no doubt to the fact that hemorrhage continued to take place within the eye after the blood outside had coagulated, thus filling out the globe to its original shape.

On microscopic examination the protruding mass was found to consist of blood clot, within which were incorporated portions of the retina, lens, ciliary body, choroid, and iris, and also islets of vitreous humor. The small portions of the cornea that remained attached to the sclera showed a marked infiltration with polynuclear leucocytes

and especially was this so at the upper margin of the cornea. The conjunctiva likewise was infiltrated with leucocytes. Except posteriorly as will be mentioned, the sclera appeared normal throughout. Within the eyeball no traces of the retina could be found, and the greater part of the choroid had also disappeared. In a few places the choroid was still attached to the sclera, but it was so infiltrated with blood that it was scarcely to be recognized. The ciliary body had evidently been stripped from the sclera, and only a few traces of it could be seen within the eye. The blood-clot itself presented an unusual appearance, for it was studded with numerous clumps of black pigment. That such clumps of pigment do not ordinarily occur in extensive hemorrhages from the choroid was determined by examination of an eye in which a large expulsive hemorrhage had taken place during an operation for cataract.

Microscopic examination of that portion of the blood-clot outlined in the photograph, which, as has been said, on macroscopic examination had been taken to be separated retina, revealed the presence of a cellular tumor mass. The tumor was more or less globular in shape, and measured 13 *mm* in its longest antero-posterior diameter, and 7 *mm* in its vertical diameter. Its horizontal diameter was estimated also at about 7 *mm*, but this could not be determined absolutely on account of the manner in which the eye had been sectioned. The optic disc showed a deep glaucomatous cup into which the tumor dipped, but the tumor cells had not appreciably invaded the nerve structure. The tumor gave evidence of having been attached to the choroid for a short distance above and below the disc. It undoubtedly left the choroid, however, at the temporal side of the disc and curved out into the vitreous body. This explains why in the photograph the tumor does not appear attached to the ocular wall. Sections made of the nasal half of the eye showed the tumor here firmly attached to the sclera, and the latter to a slight extent infiltrated with tumor cells.

The tumor cells were for the most part round or slightly oval in shape, but in some situations, usually near a blood-vessel, they became distinctly spindle-shaped. They were

quite uniform in size, the diameter of each being about three times that of a red blood corpuscle. The nuclei were vesicular and each contained a delicate chromatin network, and each nucleus also invariably contained one, but rarely two, nucleoli. Pigment was deposited in the form of fine brownish granules, both within and between the cells. It was collected most noticeably at the scleral margin of the tumor and in the vicinity of the blood-vessels. The tumor, however, was not highly pigmented. The blood-vessels were extremely numerous, and around them the cells were arranged in a manner somewhat suggestive of an angio-sarcoma. There were many large extravasations of blood within the tumor, as is so commonly the case in all forms of sarcomata.

The tumor, being as it was of the small round-celled vascular type of sarcomata, must be regarded as highly malignant. The fact, however, that although it had probably existed for at least three years, it was still of moderate size, and the fact that it had not penetrated the sclera nor invaded the optic nerve, are certainly favorable to the life of the patient.

The rupture of the cornea in this case was evidently due to the necrosis and ulceration that had resulted from the pressure continually exerted upon the cornea from within the eye. It is of course a well-known fact that a glaucomatous pressure if of sufficient duration is capable of producing ulceration of the cornea in this way. Whether the pressure constantly present in the eye was sufficient to break through the weakened cornea, or whether the rupture was the result of a sudden increase in tension due to an intraocular hemorrhage from the tumor, or in other words, whether the hemorrhage was primary or secondary to the rupture, it is difficult to say, but it is not necessary to assume that it was primary. It seems to us probable that the rupture of the cornea preceded the hemorrhage,[1] and that the latter was due to the sudden diminution in pressure

[1] Millikin (Trs. Amer. Oph. Soc., 1899, p. 488) reported a case of spontaneous rupture of the cornea followed by hemorrhage, in a woman 68 years of age, which occurred during an attack of acute glaucoma. The eye finally became phthisical, but it was not enucleated. See also Ernest Fuchs, *Text-Book Ophthalmology* (Trans. by Duane), 1898, pp. 153 and 342.

leading to rupture of the thin-walled vessels of the tumor and of the choroid. Certain it is that rupture of the cornea has been known to result from primary glaucoma and equally certain is it that an extensive hemorrhage may result from a sudden diminution in intraocular pressure, as for instance occurs sometimes during cataract operations and after iridectomies for glaucoma. Then, too, it is doubtful if an intraocular hemorrhage would appreciably increase the pressure in an eye already under a high tension, for the increase in pressure could be no greater than the difference between the pressure of the blood within the ruptured vessels and the pressure already present in the eye.

The history presented by this case, that of retinal separation followed by acute attacks of glaucoma, is characteristic of intraocular growths. The features of special interest are the long interval, two years, during which the eye was quiet, the occurrence of complete corneal infiltration, and finally, the spontaneous rupture of the cornea. Purulent infiltration of the cornea is infrequent even in primary glaucoma. It has been known to occur, however, where an intraocular growth has come in direct contact with the cornea. So far, we have been unable to find a case reported of rupture of the cornea resulting from the high tension associated with an intraocular sarcoma.

PULSATING EXOPHTHALMOS.

REPORT OF A CASE OF PULSATING EXOPHTHALMOS.

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(*With three photographs on Text-Plate IV.*)

THE history of the following patient well illustrates a typical case of pulsating exophthalmos with slight variations. It was thought to be due to the formation of an arterio-venous aneurism by a rupture of the internal carotid in the cavernous sinus. November 8, 1898, I was called to see Mrs. X, aged about 40, at the request of Dr. N. I. Graham. I found the left eye protruding prominently, the lids and conjunctiva very œdematous, and a sanguineous discharge exuding from the latter. The eyeball was pressed forward with such force that the margin of the upper lid made a deep impression on the cornea. Below the cornea the chemosis was so great that a large fold of the conjunctiva protruded through the palpebral fissure. The cornea was clear and the pupil contracted. A loud pulsating or blowing noise could be heard over the left side of the head, especially marked about the left ear.

The patient gave the following history:

The day previous she had a slight attack of coughing. About 8.30 the next morning violent pain came on about the left eye, and in about twenty minutes a pulsating noise could be heard on

the left side of the head. Swelling of the lids and protrusion of the eyeball followed in about an hour and a half. When seen a few hours later by Dr. Graham the left pupil was widely dilated. Ice compresses were applied and bromides and ergot given. On the 9th I found the chemosis much greater. I scarified the conjunctiva, but there was complete stasis. There was loss of sensation in the conjunctiva and over the left brow. The bruit could be heard also on the right side when lying on that side, and the right lids and orbital tissues had begun to be œdematous and nearly all of the left side of the face was swollen. On pressure of the lids and eyeball pulsation was felt. November 10th.—Eyeball protruded straight forward, was immovable, apparently from the great œdema; the pupil was contracted and the cornea clear, but she could not see. Lids of right eye were puffy, conjunctiva clear, pupil contracted, and vision good. The left lids were of a dull rose color. Œdema was extending down the left side of the face, over throat and neck, upper lip, and back of the ear. The patient was constipated, her mind was clear, and she did not suffer much except that the constant bruit disturbed her rest.

November 15th the patient was removed to the Episcopal Eye, Ear, and Throat Hospital. On the 16th I scarified the conjunctiva and cut off quite a large portion which was protruding. There was bleeding from the upper, but none from the lower part of the conjunctiva. On the 17th the upper part of the cornea began to ulcerate. On the 24th the cornea had perforated. Pulsation in the orbit appeared less. December 3d the case presented the appearance shown in photographs 1 and 2. About this time Dr. James Kerr succeeded in stopping bruit by pressure on left common carotid, after which periodic pressure was instituted and the exophthalmos and chemosis soon became much less. Previous attempts to compress the common carotid had failed owing to her very short and stout neck. Her temperature was about normal until December 23d, when she had an attack of facial erysipelas; it went up to 101.6, but was normal again by the 27th, and continued so until she left the hospital January 13, 1899. Ergot and potassium iodide were given quite continuously until the attack of erysipelas, when they were discontinued and large doses of iron were administered.

April 30th the eye presented the appearance shown in photograph No. 3. The exophthalmos had entirely subsided. There were enlarged tortuous veins across the upper lid and pulsation

could be felt under the brow. Pulsation of the neck over the carotid was visible and could be felt.

September 13, 1899, the bruit was still noticeable, but not so loud. The eyeball was shrunk and the lids closed and flabby from the great stretching they had had. March 26, 1901, patient is enjoying excellent health.

Ligation or compression of the common carotid seems to be the treatment most highly recommended in these cases. By the latter the dangers of the former are avoided and time is given for the establishment of collateral circulation.

THE STERILIZATION AND CARE OF INSTRUMENTS.[1]

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(*With two figures in the text.*)

THIS subject has been discussed till we are tired of it. Still we hold conflicting views, perhaps because they are many of them founded, not on rigid investigation and experiment, but, as is often unavoidable, on more or less hasty impressions and on prejudice. I may as well say, to begin with, that my prejudice was in favor of boiling alkaline solutions for sterilizing instruments, and that my experiments were undertaken to see if the objection brought forward against this method were well founded. My preference for this was founded, of course, on the overwhelming weight of evidence accumulated by general surgeons from Schimmelbusch down. Thus in the *International Text-Book of Surgery*, McBurney says[2] "no agent is so valuable as heat and only when it cannot be applied in one form or another should chemical sterilization be made use of." One to five seconds' exposure to boiling soda kills ordinary bacteria (Schimmelbusch). Compare with this 1 : 1000 corrosive is not effective after acting twenty-five minutes on staphylococci (Abbott). Obviously long before we could be sure of killing bacteria with corrosive sublimate the metal instruments would be ruined. Advantages of easy availabil-

[1] Read before the New England Ophthalmological Society.
[2] Vol. i., p. 266.

ity, simplicity, speed, and certainty of boiling need not be enlarged upon.

What I wish to speak of is the one objection brought against it, viz.: that it injures the instruments—particularly that it destroys the keen edge of cutting instruments. In many operations on the eye a very keen edge is indispensable; in nearly all operations it is highly advantageous. Therefore, if boiling destroys this no further argument is needed. We must seek some other method of sterilization even if otherwise much less perfect. I have never seen any records of experiments on this point, but the opinion is widespread that boiling does injure the edge. It appears to be taken generally for granted. It seemed to be worth investigating.

There are four conceivable ways in which the edge of a knife may be injured in sterilizing by boiling:

(1) By oxidation—rusting.

(2) By mechanical injury.

(3) By methods used to remove the solution after sterilizing.

(*a*) Wiping.

(*b*) Immersion in other liquids.

(4) By the effect of heat on the temper.

(1) The common idea, I take it, is that oxidation is the cause of the dulling. This oxidation is a chemical process. Referring to chemical authority, Roscoe and Schorlemmer, Vol. ii., p. 997, say: "Iron only rusts in the presence of oxygen and liquid water containing either carbonic or some other volatile acid or a metallic salt in solution," and p. 940, "liability to rust is diminished in the presence of alkalies." This leaves one in doubt whether the tendency is diminished sufficiently to make it safe for our purpose. There are several ways in which to test this. The most obvious one is to boil some knives a long time and compare their sharpness with that of unboiled ones. I have tried this a number of times and have let some one else test them to see if he could pick out the ones that had not been boiled. He picked out the ones which had seemed to me to be the best before the test was applied, *i. e.*, the variation in knives

before boiling is apt to be greater than the quantity we wish to measure, for it is practically impossible to pick out half a dozen knives and say they are all exactly equal in sharpness. In my experience the boiling did not damage them enough to tell which had been boiled and which not. In some of these trials the knives were left boiling longer than I intended. As a result the water was nearly all boiled away. I found in these cases evidences of oxidation. This, together with the statement of Roscoe and Schorlemmer that a metallic salt in solution fulfilled one of the conditions of oxidation (and of course bicarbonate of sodium is a metallic salt), made me suspicious. I felt that some better method of testing was needed.

Observing how conspicuous a small spot of rust is on the polished blade of a knife, it occurred to me that some polished steel plates many times larger than the knife-blade might be used to test the oxidizing action of boiling and of other processes. I had a number of steel plates made with polished surfaces in area from fifty to one hundred square centimetres. Some of these plates were boiled in a 1 per cent. solution of bicarbonate of sodium for several hours in a sterilizer, care being taken that the water did not boil away. After about three hours faint spots appeared on the plates. After five hours well-marked oxidation was present. From this I concluded that for practical purposes bicarbonate of sodium was safe, since three hours = 180 minutes = 10800 seconds, the time required to injure the steel, is 1000 times as long as the time required to kill the bacteria. I accounted for the oxidation which occurred after several hours' boiling in a solution of bicarbonate of sodium by the fact that a metallic salt was present, and for the slowness of oxidation by the fact that "liability to rust is diminished in the presence of alkalies."[1]

Another series of experiments consisted in boiling a number of the polished steel plates in a 1 per cent. solution of

[1] If the sterilizer is of such material that it is acted upon by the boiling soda it is possible to get conditions favorable for tarnishing the instruments. I have known this to occur, and I am not able to rule it out in this experiment; in fact, the solder inside this sterilizer was extensively eaten away as a result of several months' usage.

caustic potash in distilled water in the same sterilizer. Repeated trials of boiling for from one to twelve hours in this solution failed to show the least sign of tarnishing. My conclusion is that if one is afraid of boiling in a solution of bicarbonate of soda because it may, in the course of hours, produce some oxidation, he may use a solution of potassium or sodium hydrate in distilled water and boil his instruments without fear of rusting. A solution of caustic potash is also valuable as a means of keeping needles in a small, wide-necked bottle. No instruments approach needles in liability to rust, none are so hard to obtain and to keep free from rust. Alcohol is often used for this purpose, but it absorbs water rapidly and ceases to be a sure preventive. Caustic potash absorbs carbonic acid so that we have a solution containing a metallic salt (carbonate of potash), but I have found that needles will keep many months untarnished in these solutions.

(2) The second possible way that dulling might take place is by mechanical injury,—by jolting against other instruments,—whether through ebullition of water in active boiling or through careless handling. These are obvious possibilities which need only to be pointed out to be admitted. They are quite avoidable with proper care and right methods and therefore do not form a valid ground for rejecting this way of sterilizing instruments. The method of tying a handful of instruments together loosely in a towel does very well for the large and strong instruments of the general surgeon but is obviously unsuitable for delicate instruments. Knives may be wrapped in cotton and laid on a tray in the boiling solution, but I much prefer to dip keratomes and other delicate knives in the boiling solution, holding them for a few seconds and taking great care not to touch anything with the blade except the water. This is amply sufficient to sterilize ordinary keratomes. Should it be desired to sterilize one which had been used in such a way as to possibly infect it with pathogenic bacteria, it should be boiled longer and the process repeated.

(3) The third possible way suggested was by methods used to remove the solution after sterilizing. First, by wiping. This is a source of injury very much underestimated. It is

certain that wiping a knife, unless very carefully and skilfully done, will mar the edge to a greater or less degree. I think this is a very important point. Repeated testing on a drum or otherwise is another obvious method of diminishing the keenness of point and edge. Second, by immersion in liquids. The liquids commonly preferred are alcohol and aqueous solutions containing boric acid, carbolic acid, salt, or soda. If the knives are laid in a tray of alcohol or other liquid with other instruments, it is very easy for them to receive mechanical injury by being struck against other instruments or against the tray. This is avoidable, however, and unless other objection could be raised, would not be sufficient to warrant rejection. What is the action of the solutions chemically? Alcohol contains more or less water; if it contains enough it will rust the instruments. We should expect that the aqueous solutions, except the soda solutions, would attack the steel, but perhaps we might think that they would act so slowly as not to be practically injurious. Here is a polished steel plate which you saw me place in this solution of boric acid. It has been exposed less than ten minutes but already shows loss of brilliancy and in another ten minutes the oxidation will be most apparent.[1]

(4) The effect of boiling on the temper of knives is nothing if care be taken that they do not rest directly on the bottom of the vessel in which they are boiled, lest they become heated above the boiling-point.

To summarize my results so far: (1) boiling alkaline solutions do not oxidize steel appreciably in the time required for sterilization. (2) Wiping does injure the edge of cataract knives, knife-needles, and the like. It should not be re-

[1] The suggestion was made that the rapid action on instruments which occurs when they are placed in boric-acid and similar solutions is due to corrosive sublimate which adheres in minute traces to the trays and other vessels in spite of careful washing. To test this theory some new glass and agate vessels and trays were carefully cleansed and filled, some with boric-acid solution, others with alcohol. Polished steel plates placed in these solutions became tarnished, those in boric acid in 15–20 minutes, those in alcohol after several hours, having absorbed water from the air. Some similar vessels were filled with 1:1000 corrosive and left 24 hours, then rinsed with no especial care and filled, some with solution of bicarbonate of soda, some with solutions of caustic potash. Steel plates placed in these solutions remained untarnished 24 hours. A few drops of 1:1000 corrosive were then added and after half an hour the plates were *still untarnished.*

peated unnecessarily and deserves far more attention than it has received. (3) Immersing the instruments in boric-acid and similar solutions is highly objectionable on account of rapid rusting. Moreover, the additional process of putting them into the tray of boric acid or carbolic acid exposes them to added risk of mechanical injury. They should be placed dry on a sterile cloth and, if desired, dipped in water just before using. (4) Leaving knives unwiped after using is obviously an excellent opportunity for rusting.

Next, as to the other methods of sterilization. Two may be considered:

(1) Wiping with sterile solutions—a mechanical process.

(2) Formaldehyde gas in a sterilizer made for the purpose.

(1) Wiping with sterile solutions, such as alcohol, sterile water, corrosive, Panas' solution, etc., can sterilize a well-polished blade. It is not a very sure method—not one to be trusted to any one but the operator himself—and fails when the instrument is not perfectly smooth and free from rust or scratches where dirt may lodge. It will not do for forceps, etc. Whether the solution used contains a small quantity of corrosive or the like is of little consequence, since ten to twenty minutes is not enough to kill. An alkaline solution is best, because it is detergent. Stroschein allowed pus or pure cultures of bacteria to dry on knife-blades. He then put them through the following process: (1) Wiping ten to fifteen times with cotton dipped in equal parts of alcohol and ether, plus a few drops of ammonia. (2) Rubbing one minute with 5 per cent. carbolic acid. (3) Immersion in sterile salt solution to remove the antiseptic. These were sterile, but he says the solutions injured the edges. (It is pretty safe to say that wiping injured the edges even more than the solutions.)

(2) Formaldehyde sterilizer. Many investigations have been made on the action of formaldehyde as an antiseptic and its value pretty well established. It is wonderfully effective superficially but does not penetrate.

The following experiments may be mentioned. I took some very small iron and brass machine-screws as having an uneven surface in whose recesses bacteria might be less accessible than on a

knife-blade and which would therefore reproduce the conditions found in toothed forceps and similar instruments. These were dipped in a mixed culture of various bacteria and allowed to dry. Then they were exposed in the Reik formalin sterilizer, one lot for ten minutes, one lot for two ten-minute exposures, one lot for three ten-minute exposures. Then they were exposed to the air and a little vapor of ammonia to remove all formaldehyde and placed each in a bouillon tube in a thermostat. In a few days all except those containing brass screws were very turbid. A second time the same thing was done, using a pure culture of staphylococcus aureus and another of streptococcus pyogenes, and again all the tubes were turbid, but on examining the bouillon Dr. Verhoef, who did the bacteriological part of the experiments, found that they were all sterile. The turbidity was a chemical precipitate of iron rust or the like. Thus our results confirmed those of Reik and others in showing no growth after ten minutes' exposure in the formalin sterilizer.

It appears, therefore, that for practical purposes it is a fairly safe method. Does it injure the instruments? I cannot say definitely. I think it may, for the following reason: If one of these polished steel plates is placed in the sterilizer and the lamp lighted, it is found if examined after one minute that the surface is covered with drops of liquid which have condensed on the plate. This must be water and contain carbonic acid from the combustion of the alcohol. As water containing carbonic acid is just what is needed for rusting iron, provided oxygen is present (and the lamp goes out before all the oxygen is removed, of course), we have for a short time, until the water evaporates again, the most favorable conditions for rusting.

In regard to keeping instruments, I have little to say. I think that the most important point is that they be put away dry and clean, and preferably sterile. What they are kept in is of less importance. I think their greatest danger is from mechanical injury. Therefore I do not like metal cases, and while velvet is less clean than wood, in my opinion it is better for the most delicate knives for private use (not hospital, except for storage). They are better protected, and if there should be some dust on them they must in any case be sterilized and it will not matter, whereas injury of

point or edge against a wooden case, or a possible spot of rust, is a serious damage which does matter very much.

If it is desired to be very careful, one can be sure a knife will not rust if it is covered with a non-drying oil (*e. g.*, vacuum oil), to which may be added some prepared chalk. The oil excludes water, and the chalk neutralizes any acid. For example, one of these steel plates so covered was left for a long time on the shelf over the wash-basins and sterilizer at the infirmary, where it was exposed to damp air and changes of temperature. It showed not the slightest sign of rusting. I have kept instruments at my office in that way for years without tarnishing. In general, a well-polished instrument will not rust if it is put away dry, but it *may*, and the edge or point is more likely to be attacked because moisture is more likely to condense on a point or edge than on a smooth surface unless there is a particle of dust on the surface (*cf.* the formation of crystals in a supersaturated solution).

What I have said so far applies to metallic instruments, chiefly knives. I think few would object to sterilizing non-cutting metallic instruments, for example, specula, forceps, etc., by boiling. Suppose one wishes to use an instrument not prepared beforehand, or contaminated during an operation, for example by dropping it; if he relies exclusively on formaldehyde he must wait ten minutes, which is usually out of the question. If he relies on boiling he need wait only ten seconds instead of ten minutes.

There are a few other instruments of which I wish to speak. I may say here that all instruments should, when possible, be made of such material that they will not be injured by boiling, therefore not of aluminum, hard rubber, or bone. Glass trays and bowls are objectionable, because they cannot so easily be boiled as agateware can, though they may look better.

Droppers can be sterilized by boiling or in the steam sterilizer. A convenient and safe place to keep them is desirable. This box (see Figs. 1 and 2) is intended to fulfil this purpose. It has proved exceedingly convenient and valuable in actual use. Probably there is no instrument which more

often carries dirt from eye to eye or from eye to collyrium than the dropper, not even the finger.

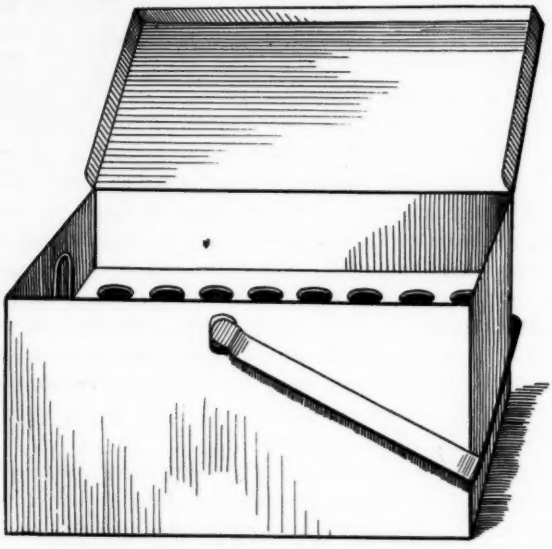


FIG. 1.

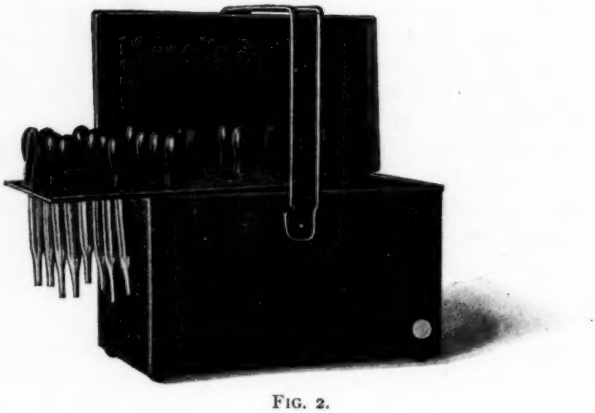


FIG. 2.

The box is of copper, nickelled. It is 10 x 10 x 20 centimetres and has a strong handle and a hinged cover. Inside is a

removable tray, perforated with holes large enough to readily admit the glass tube of a dropper, but not large enough to admit its rubber bulb. The tray rests on supports at such a height that when the droppers are in place they do not touch bottom or cover.

A small quantity of water may be put in the box and boiled and the steam will sterilize the droppers, the cover being shut. Another way is to put the box in a steam sterilizer, when it is well to leave the cover ajar to freely admit the steam. A third way is to immerse the whole in water and boil. A receptacle should be at hand to receive the droppers as fast as they are used. They should be rinsed always before any of the collyrium has time to dry on, otherwise atropine, for example, may adhere in sufficient quantity to be passed on to another eye where it is not wanted. During several months' daily use this accident has not occurred. Sterilization by immersion in boiling water answers the twofold purpose of removing all traces of collyria left in droppers as well as destroying bacteria. It has the disadvantage of filling the box with water, which must be removed after the sterilization. For this purpose the bottom may be made with holes and covered with a few thicknesses of gauze or cotton to let the water out but prevent dust from getting in. Or the box may be provided with a tiny faucet, as suggested by Dr. Standish. The same object may be accomplished by tipping the box with the cover ajar, so that the water will drain off. Plain water should be used, not a solution of soda, because enough of the soda will adhere to the droppers to affect some of the collyria, especially cocaine, which becomes irritating, and holocaine, which is decomposed.

When a dropper is taken from the box and filled from a bottle of collyrium neither the dropper nor any of its contents should be returned to the bottle if it is intended to use the collyrium on another patient, or on the same patient on another day. If this rule is strictly adhered to, no bacteria can be passed from eye to collyrium and so to another eye.

Still another instrument that deserves more attention is the ether inhaler. The ether cone is particularly liable to

become a part of the operating field when we are placing the sutures, for example, in an advancement. To protect sutures from ether cone, beard, face, etc., and secure as sterile a field as possible, I am in the habit of using a piece of cotton cloth 30 x 40 centimetres with an oval opening in the middle about 5 x 8 centimetres which I call a window.

I would call particular attention to the following points:

(1) That boiling in alkaline solutions does not rust instruments if properly done.

(2) That soaking them in solutions of boric acid, salt, or even alcohol does harm them, and, as far as I can see, is *entirely unnecessary* (our technique is elaborate enough without adding unnecessary details).

(3) In regard to preservation of instruments, that putting them away dry and clean is more important than the kind of case, and that a velvet case for the most delicate knives has fewer objections than a metal or even a wooden one.

(4) That coating with oil, which is very easily removed by boiling soda, is a sure preventive of rust.

(5) Droppers should be supplied for every patient and not used more than once without resterilizing.

(6) Syringes and the electric instruments, both cauteries and magnets, should be tested weekly.

PATIENT WITH OXYCEPHALY AND OPTIC-NERVE ATROPHY.

ON OPTIC NERVE ATROPHY ASSOCIATED WITH CRANIAL DEFORMITY.[1]

By Dr. HARRY FRIEDENWALD, Baltimore, Md.

(With two photographs on Text-plate II. and two charts of the field of vision in the text.)

CASES of blindness associated with certain types of cranial deformity form an interesting group. In 1893 the writer collected sixteen cases of this kind which had been published, and added one.[2] Since that time the subject has attracted little attention, if we except a résumé of the subject, written by Swanzy, in Norris and Oliver's *System of Diseases of the Eye.* The following case, therefore, deserves publication:

The patient, a small negress, aged about forty-five years, applied for treatment at the Baltimore Eye, Ear, and Throat Charity Hospital, September 18, 1900. She was born of slaves, and knew nothing of her relatives. The history as obtained from her was very meagre. The peculiar deformity of her head attracted our attention. This, she said, had been observed since her earliest childhood. As a child she was very near-sighted, but went to school for four years. She was never able to read fine print, and the right eye was always much worse than the left.

She stated that her sight had been worse since an attack of grippe during the past winter, though it had been failing before. She had suffered with headaches all her life; of late, giddiness was sometimes added. She had had epileptic convulsions from her thirteenth year. A number of years ago (10?) a laparotomy was performed, and since then her convulsions were very rare. She had

[1] Paper read and patient presented at the Maryland Ophthalmological and Otological Society, Oct. 25, 1900.

[2] *Amer. Jour. of Med. Sciences*, May, 1893.

also had "constant movements of the head" after she entered adult life; this symptom disappeared a number of years ago.

Stat. Præs.: There is a high degree of divergent strabismus of the right eye (without paralysis) and marked exophthalmus. The vision of the right eye is $\frac{3}{60}$, that of the left eye $\frac{6}{12}$. The fields of vision of both eyes are markedly contracted (see charts). In direct vision the left eye recognizes blue, green, yellow, and red; the right eye recognizes blue, red, and yellow, but not green. Pupillary reaction is normal. The ophthalmoscopic examination shows distinctly post-neuritic atrophy of both nerve heads. The papillæ are white, the laminæ cribrosæ are not visible, the margins of the papillæ are very irregular, the retina near the papillæ has a slightly speckled appearance, and the vessels in this neighborhood have well-marked perivascular streaks.

There is no spur on the skull, but in the region of anterior fontanelle there is a large prominence. The patient's height is 146 *cm.* The measurements of the head are as follows:

Circumference of the head, 467 *mm* (average for women, 530 *mm*).

Greatest antero-posterior diameter, 168 *mm* (average for women, 182 *mm*).

Greatest lateral diameter, 129 *mm* (average for women, 150 *mm*).

Inferior width of frontal bone, 93 *mm.*

Greatest diameter between malar bones, 120 *mm.*

Diameter from just above tragus to opposite side, 112 *mm.*

Distance from glabella to root of hair, 19.5 *cm.*

Distance from chin to glabella, 13 *cm* (average 124 *mm*).

Distance from root of hair to mouth (closed), 154 *mm.*

Distance from auditory canal to outer margin of orbit, right side, 64 *mm.*

Distance from auditory canal to outer margin of orbit, left side, 64 *mm.*

Distance from ear to middle of closed mouth, right and left side, 121 *mm.*

Distance between two external orbital margins, 97 *mm.*

Right orbit, 37 *mm* high, 28 *mm* wide.

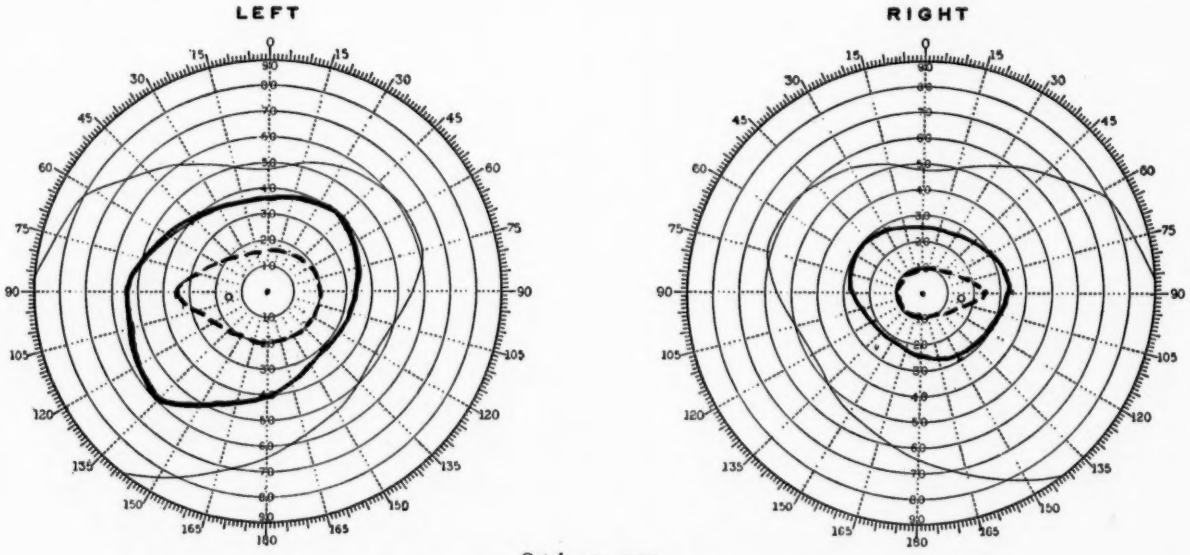
Left orbit, 37 *mm* high, 28 *mm* wide.

Distance of upper orbital edge to closed eyelid, right eye, 30 *mm.*

Distance of upper orbital edge to closed eyelid, left eye, 30 *mm.*

Distance from middle of eyebrows, right eye, about 33 *mm.*

Distance from middle of eyebrows, left eye, between 32 and 33 *mm.*



October 19, 1900.
Black line is field for white. Dotted line is field for red.

From these measurements it will be seen that the abnormality is very marked. The condition is well shown in the accompanying illustrations taken from photographs (Text-plate II.).

Short reference may also be made to the important contribution of Weiss and Brugger, which appears in the German edition of these ARCHIVES.[1] The case described is that of a boy, aged fourteen years, who had had weak sight since early youth, and who presented characteristic oxycephaly. V : R E, $\frac{3}{60}$; L E, $\frac{5}{60}$, with slight hypermetropia. There was marked exophthalmus. The limits of the fields of vision were somewhat restricted. There was dynamic divergence of 2° for the distance of 18° to 20° for near vision. The papillæ were markedly pale and of bluish-gray color; each was surrounded by a light halo, and in the maculæ there were a number of fine spots and points with increase of pigment between them. The picture was manifestly the result of early neuritis or neuro-retinitis. Measurements of the skull and of the orbit greatly resemble those in the case mentioned above.

Weiss and Brugger also examined and measured carefully four steeple-shaped skulls in the Heidelberg Anatomical Institute. These measurements, when compared with the measurements of the average normal skull, show extraordinary development of the height, while the sagittal diameter fell below the normal. On the other hand, the lateral diameter more nearly approximated that of the normal skull. The height of the orbit was commonly found greater than the horizontal diameter, at times in very marked degree, but the most marked difference lay in the much greater shallowness in the oxycephalic orbit, the normal being 10 *mm* deeper than the average oxycephalic orbit. This reduces the orbital cubic contents 6 *ccm* below the average. This difference in the shape of the orbit is mainly due to a change in the position of the greater wings of the sphenoid, which, instead of forming the lateral wall of the orbit, become the posterior wall, and thus give the orbit the shape of a truncated cone. Weiss and Brugger point out that this abnor-

[1] Vol. xxviii.

mality of the orbit accounts for the prominence of the eyeballs.

The optic foramina were not abnormally narrow in any of the cases. The dorsum sellæ turcicæ was markedly enlarged and pushed forward in all the skulls. This peculiarity suggested to Weiss and Brugger that at a certain time in early childhood pressure may have been exerted upon the chiasm or optic nerves.[1] They also call attention to the fact that steeple-shaped skulls are usually made up of *very thin* bones. As characteristic, they find synostosis of the coronal suture; synostosis of the sagittal suture is also often present. The cubic contents of these skulls was not abnormally small nor was there any evidence of disease of the bones.

I append a table which includes the cases previously collected by me, which with some additional cases makes a total of nineteen cases of cranial deformity.

Oxycephalic variety. Twelve cases in the list belong to this class (Nos. 2, 7, 8, 9, 11, 12, 13, 14, 15, 17, 18, 19).

Their ages vary from four months to sixty years. Eleven were males, one was a female. The ophthalmoscopic examination showed optic atrophy in all,—and in nine this is described as *neuritic* atrophy. Vision varies greatly. In five, vision was good in one eye, while the other was blind or almost blind; in four, vision was lost or almost lost in both; in one, vision was fair in both eyes, and in one, poor in both. Divergent strabismus is mentioned in three cases and exophthalmus is constant. Epilepsy is noted in but one case. Pathological data are very meagre. In Case 2 there were hyperostosis, pachymeningeal thickening, and narrow optic foramina. In Case 15 the base of the skull was irregular with narrow optic foramina. But these observations are not in accord with those of Weiss and Brugger.

Other varieties.

Besides the steeple-shaped skulls the table contains:

Three long skulls (Nos. 1, 3, 10).

One leptocephalic skull (No. 6).

One with broad forehead (synostosis of sagittal suture) (No. 5).

[1] Simple atrophy would be the result, but *neuritic* atrophy is almost always found.

One with bulging in temporal region, especially on right side (No. 4).

One deformity of skull, not described (No. 16).

The eye symptoms mentioned in the "long head" cases are similar to those of oxycephaly. There were optic neuritis and neuritic atrophy; two were blind in one eye and had some vision in the other, and both had divergent strabismus.

Cases 4, 5, 6, likewise showed neuritic atrophy.

Though the entire number of cases is small, the constancy of the symptoms enables us to conclude that the blindness found associated with variously deformed skulls, and especially with steeple-shaped skulls, is due to an early neuritis followed by atrophy. Various hypotheses have been suggested to account for this. Virchow and Hirschberg attribute both the cranial deformity and the disease of the optic nerves to diseases of the meninges, especially the dura. Manz likewise suggests fœtal meningitis and osteitis as the underlying cause. The writer still holds to the opinion previously expressed, that the optic neuritis in these cases depends upon the increased intracranial pressure produced by premature synostosis, and is therefore similar to that associated with tumors of the brain.

TABLE.[1]

Reported by	Sex.	Age.	Deformity.	Vision.	Ophthalmos. appearance.	Autopsy.	Remarks.
1. v. Graefe, *Arch. f. Ophth.*, xii., 2, p. 133.	M	8	Long, narrow skull.	Complete blindness, which came on suddenly.	Papillo-retinitis.	....	Pupils widely dilated. Patient cured. Mother epileptic, father drunkard and suicide. Other children died young.

[1] The interesting case of Powers (*Trans. Ophth. Society of the United Kingdom*, 1894, p. 212) cited by Swanzy is not included, belonging more properly to the class of monstrosities. Weiss and Brugger mention two brothers seen by Oeller; both had oxycephaly and neuritic atrophy. Further details are not mentioned.

Reported by	Sex.	Age.	Deformity.	Vision.	Ophthalmos. appearance	Autopsy.	Remarks.
2. Michel, *Arch. d. Heilke.*, xiv., p. 39. also *Handb.d. Kinderkr.*	M	15	Steeple-shaped skull.	....	Neuritis followed by atrophy.	Hyperostosis of skull. Optic foramina narrow. Pachymeningeal thickening over cortex.	Probably hereditary syphilis.
3. Hirschberg, *Centralbl. f. Augenheilk.*, January, 1883.	M	5–14	Scaphocephalus (Virchow).	R = $\frac{15}{cc}$; L =0. Visual field concentr; narrowed to about 20° in all directions. Blindness came on gradually. L. E. turns out.	When first seen optic neuritis, later atrophy.	....	Had convulsions. Eyes prominent.
4. Hirschberg, *loc. cit.*	F	3	Great bulging of temporal regions, especially on right side (Virchow).	Slight visual power. Gradually reduced.	Neuritic atrophy.	...	....
5. Hirschberg, *loc. cit.*	M	15	Synostosis of sagittal suture, with very broad forehead (Virchow).	V. defective since early youth. R = $\frac{15}{cc}$, L almost blind and divergent. R field reduced 10°–20°.	Neuritic atrophy.	....	Had convulsions. Intelligence fair.
6. Hirschberg, *loc. cit.*	M	4½	Leptocephalus (Virchow).	Gradual blindness during first year, then complete.	Neuritic atrophy.	....	Peculiar cranial deformity noticed at birth.
7. Hirschberg, *loc. cit.*	M	20	Skull narrow and high.	R = $\frac{15}{xx}$, field normal, L counts fingers at 5' excentric. L divergent.	Neuritic atrophy.	....	Deformity noticed at birth. Intelligence good.

Reported by	Sex.	Age.	Deformity.	Vision.	Ophthalmos. appearance	Autopsy.	Remarks.
8. Hirschberg, *loc. cit.*	M	7	Steeple-shaped skull.	R = $\frac{15}{xx}$, field fair, L = 0.	Papillæ atrophic, light greenish white color.	....	....
9. Hirschberg, *loc. cit.*	M	9½	Steeple-shaped skull.	R = $\frac{15}{xx}$, field very narrow, 20° in every direction. L = 0. Divergence.	Atrophy.	....	Maternal grandfather had same deformity. Intelligence good.
10. Vossius, *Klin. Monatsbl.*, 1884, p. 172.	M	7½	Long skull, temples very wide, glabella broad, forehead low and rises very slantingly	R = 0. L counts fingers at 8'. Divergence.	Atrophy. (probably neuritic H. F.).	....	Intelligence normal.
11. Stood, *Klin. Monatsbl.*, 1884, p. 248.	M	4 mos.	Steeple-shaped skull.	Light perception.	Neuritic atrophy.	....	Child born after labor of 4 days. Frontal presentation.
12. Manz, *Bericht d. Heidelberg Ophth. Gesellschaft*, 1887.	M	50–60	Steeple-shaped skull.	Had some vision as child but gradually lost it almost entirely.	Neuritic atrophy.	....	....
13. Manz, *loc. cit.*	M	40	Steeple-shaped skull.	Had slight vision but lost it almost entirely after variola. R = 0. L counts fingers.	Neuritic atrophy.	....	....
14. Manz, *loc. cit.*	M	Young man.	Steeple-shaped skull.	Blind since early childhood. Slight perception of light in left eye.	Neuritic atrophy.	....	....

Reported by	Sex.	Age.	Deformity.	Vision.	Ophthalmos. appearance.	Autopsy.	Remarks.
15. Manz, *loc. cit.*	M	40	A symmetrical steeple-shaped skull.	R = 0. L about ½; due to neuritis. After disappearance of neuritis central V became normal but permanent defect in the field remained.	L. Old atrophy. R. Fresh papillitis due to intracranial tumor.	Cause of death: Osteosarcoma on inner surface of right parietal and temporal bones. Base of skull very irregular. Foramina large and edges sharp, but optic foramina narrow.	Died at age of 42. The deformity of the skull was old, the tumor recent.
16. Ponfik, quoted by Manz, *loc. cit.*	..	....	Deformed skull.			Stenosis of optic foramina.	Details not accessible.
17. H. Friedenwald, *Amer. Journ. Med. Sciences*, May, 1893.	M	28	Steeple-shaped skull.	R = $\frac{8}{xviii}$ L = $\frac{9}{xviii}$	Neuritic atrophy.	....	Intelligence very good.
18. Weiss and Brugger, *Arch. f. Augenheil.*, vol. xxviii., see above	M	14	Steeple-shaped skull.	R = $\frac{3}{ix}$ L = $\frac{5}{ix}$	Neuritic atrophy.	....	....
19. H. Friedenwald, see above. ARCH. OF OPHTH., xxx., 1901	F	45?	Steeple-shaped skull.	R = $\frac{2}{ix}$ L = $\frac{6}{xii}$ Divergence.	Neuritic atrophy.	....	Epileptic convulsions. Intelligence fair.

CLINICAL CONTRIBUTIONS.

By ROBERT L. RANDOLPH, M.D., Baltimore, Md.

I.—HERPES ZOSTER OPHTHALMICUS RESULTING IN LOSS OF THE EYE.

II.—DOUBLE SUPPURATIVE IRIDO-CHOROIDITIS IN ASSOCIATION WITH PURPURA HEMORRHAGICA.

I.—HERPES ZOSTER OPHTHALMICUS RESULTING IN LOSS OF THE EYE.

THE case which I have recently seen is sufficiently rare to merit a place among the records of herpes zoster ophthalmicus.

P. J. M. Farmer. Sixty-nine years old. A well-nourished and healthy individual and one who has always enjoyed good health. On March, 20, 1900, he was attacked with what his physician at first thought to be facial erysipelas, but which proved to be herpes zoster ophthalmicus, limited to the left of the median line of the forehead. His left eye became inflamed about the same time. He was treated for some weeks by his family physician, and I saw him first early in October, 1900, more than six months after the commencement of the trouble. He was still suffering with the neuralgia and he had not had a good night's rest for many weeks. The entire forehead to the left of the median line was the seat of pitted scars which were also quite numerous back into the scalp. There was complete loss of sensation over this area. There were some few scars on the left side of the nose a little below the root of the latter. The pain of which he particularly complained was located within the left nares and frequently extended backward over the left side of the scalp.

This seems to be a verification of the statement made by Hutchinson, that such an irritation of the nasal branches of the ophthalmic nerve is oftenest associated with keratitis, and the reason for this is to be found in the fact that the nasal branch of the ophthalmic nerve supplies the filaments which enter into the ciliary nerves. It was the corneal trouble which brought him to see me.

The lower half of the cornea was occupied by a deep-seated infiltrate which had made its appearance a few days after the eruption on the forehead. This area of infiltration had imperceptibly grown and now occupied about a fourth of the corneal area and was situated a little below the centre of the cornea. The corneal trouble might be properly called an ulcer, but the actual loss of substance was confined to a very small point in the middle of the infiltrated area. The pericorneal injection was slight.

All of the usual constitutional and local remedies were tried but with practically no effect. For ten days he was taking twelve grains of quinine daily and using locally atropine and a compress bandage. It seemed that for a time he improved under this treatment, but the improvement was of short duration and nothing seemed to retard the course of the corneal disease. The ulcer became deeper and six weeks after I first saw him hypopyon made its appearance. The vision at this time had been reduced to light perception. He now complained of sensitiveness to light in the other eye, and as I saw no prospect of saving the diseased eye it was enucleated. By this time the whole cornea was gray. The operation was followed (as I had hoped) by complete cessation of the neuralgia. This freedom from pain, however, lasted for only a month and at the present time is almost as bad as ever. The relief which followed the enucleation seemed to point to the probability of the nerve endings in the cornea being in a state of active irritation, and is to be distinguished from those cases where nutritive disturbances occur from paralysis of the ophthalmic branch of the fifth.

Noyes[1] in 1873 reported a case of herpes zoster ophthalmicus in which the eye was destroyed and where some months later the other eye was affected sympathetically and lost.

[1] *Trans. Amer. Oph. Soc., N. Y.*, 1873, ii., pt. 1, 71.

This case is remarkable for the destructive results of the disease in causing directly the loss of one eye and remotely the loss of the remaining eye. Interesting communications on this subject have been made by B. Joy Jeffries,[1] Hybord,[2] and others.

II. — DOUBLE SUPPURATIVE IRIDO-CHOROIDITIS IN ASSOCIATION WITH PURPURA HEMORRHAGICA.

Optic neuritis and retinal extravasations have been observed not unfrequently in purpura hemorrhagica, such cases having been reported by Stephen Mackenzie (*British Medical Journal*, Jan. 28, 1882), Lawford (*ibid.*), and others. The case reported by Mackenzie was that of a blacksmith twenty-eight years old, while Lawford's case was a girl twelve years old. In both cases there was bleeding from the gums, and the diagnosis of purpura hemorrhagica had been made. A very interesting case, in which there were extensive retinal hemorrhages, occurred in the practice of Dr. Goodhart (*The Lancet*, Jan. 26, 1878).

I have searched the literature of this subject diligently and have failed to find the record of a case which, in so far as the eye symptoms are concerned, bears the slightest resemblance to the following:

Mary E., eight years old. She had always been a healthy child, and even up to the day before she was taken sick she was apparently in the best health. On the 19th of December, 1900, she broke out all over in dark-red spots and was much nauseated and had high fever. Her family physician made the diagnosis of purpura hemorrhagica and treated her accordingly. In three days the spots faded, but the next day the eyes became intensely congested and she complained for the first time of being unable to see out of her right eye. The next day her vision was gone in the other eye. She came to see me on March 3d, a little over two months after the commencement of the trouble. The eyes presented the typical appearance of a non-fulminating suppurative choroiditis. The lenses were opaque, and the eyeballs generally

[1] *Trans. Amer. Oph. Soc. N. Y.*, 1873, ii., pt. 1, 73–78.

[2] *Du Zona Ophthalmique et des lesions Oculaires qui s'y rattachent.* 4°, Paris, 1872.

but not intensely congested. The lenses lay well up against the irides, and both pupils were distorted, especially the right one. The pupils were partially dilated, atropine having been used early in the history of the trouble. The eyeballs were very soft and somewhat sensitive to pressure. Blindness was absolute. The fact that the child had been a great sufferer with her joints for weeks (she was in bed seven weeks) leads me to regard the case as one of the so-called rheumatic type of purpura hemorrhagica.

No organism has been constantly found in these cases, bacteriological examinations usually revealing some one of the pyogenic bacteria, either a staphylococcus or a streptococcus. The colon bacillus has been found in a certain number of cases (Ziegler's *Beiträge*, Bd. 14, S. 149), while Tizzoni and Giovannini (*ibid.*, Bd. 6, S. 299) have isolated a new bacillus in three cases. Judging from the general clinical symptoms the infection in my case must have been very intense.

The eyes present now somewhat the appearance which we see in suppurative choroiditis after cerebro-spinal meningitis. The rapid loss of vision could have been caused by a direct invasion of the entire uvea by either the bacteria themselves or their toxins, or the same condition could readily have been brought about by the enormous extravasations into the vitreous, a very likely occurrence in view of the widespread vascular changes elsewhere.

ON THE INJECTION OF STERILE SALT SOLUTION INTO COLLAPSED EYEBALLS. REPORT OF TWO CASES.

By Dr. ELMER G. STARR,

CLINICAL PROFESSOR OF OPHTHALMOLOGY, UNIVERSITY OF BUFFALO, N. Y.

In the May, 1899, issue of this Journal, Dr. Herman Knapp reported the successful use of a weak solution of sodium chloride injected into collapsed eyeballs. Guided by this report I made use of the method in July, 1900, after extracting a dislocated lens.

Case 1.—The eye had been blind and the lens dislocated for many years. For some weeks prior to the time of the operation the eyeball had been more or less red and painful, with exacerbations of increasing frequency. On examination the eye was found normal in tension and the vitreous clear. There were extensive choroidal changes. The lens was opaque and could not be seen lying at the bottom of the vitreous. By holding the head down, or by lying on her face, the patient could, at times, make the lens present behind the pupil.

The eye was cocainized and the lens removed by means of a loop through an upper corneal incision. The lens was found to be attached at its lower margin, the suspensory ligament at that part evidently being unbroken ; furthermore, the lens proved to be calcareous, being very hard and rough, so that difficulty was experienced in removing it and much force was used ; when this was finally accomplished about half the vitreous was lost, and the eyeball had the shape of a cup, the cornea forming the concavity. A warm solution of sodium chloride, 0.6%, was injected into the globe until it was plump and the lips of the wound were in apposition, and a bandage was applied. After twenty-four hours the wound was found closed and the eyeball was full and round. A mild iritis developed, which subsided in the course of

ten days. The eyeball has since continued in good condition, with normal tension.

CASE 2.—Mr. G. H., twenty-eight years old, had an intraocular growth following injury to the right eye three years previously. The injury was caused by a piece of iron striking the eye, cutting through cornea and lens. The lens had absorbed and the pupil was closed. The iris was pushed forward by the growth until it was in contact with the cornea on the nasal side, and the eye was becoming irritable.

Under anæsthesia, a section was made through the cornea and iris with a cataract knife, and an attempt was made to separate the growth from its attachment. This was found difficult to do, as it was tough and appeared to have a deeper origin than was supposed. It was necessary to enlarge the corneal wound and seize the growth with forceps before its section could be accomplished. During these manipulations fluid vitreous was constantly escaping, so that when the operation was complete the eyeball was very soft, although not collapsed. A warm 5 % solution of boric acid was injected into the globe and a bandage applied. The wound soon healed, and, while there was some bulging at the site of the wound, this entirely disappeared during the next three weeks, and the eye now has good shape and tension.

REROrT OF THE MEETING OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM, MARCH 14, 1901.

By Mr. C. DEVEREUX MARSHALL.

G. ANDREW CRITCHETT, M.A., F.R.C.S.E., PRESIDENT, IN THE CHAIR.

The evolution of the color sense. This paper was read by Dr. F. W. Edridge-Green, who separated color-blind people into two classes, which are distinct from each other, though both may be present in the same person. In the first class there is light as well as color loss, and in the second the perception of light is the same as in the normal-sighted. In the latter group he classifies according to the number of colors which they see in the spectrum, thus pentachromatic, tetrachromatic, etc., up to monochromatic. In studying ancient works, specimens, etc., all things point to the fact that the sense of light was developed before that of color, and, as we should expect, we find that those colors which differ most in wave lengths are first perceived. The spectrum was first seen as gray, then with a tinge of red at one end and violet at the other. As the color sense was developed, it was not necessary that the rays should be so far apart before a difference was seen, and so the gray band gradually diminished until it entirely disappeared, and the two colors met in the centre of the spectrum. A third color, green, then appeared at the central point; then yellow, then blue, and finally orange, making the normal six.

In some persons evolution has proceeded farther, and seven colors are seen, there being two colors between the green and the violet; the extra one has been called indigo. We find that paintings were first monochromatic, then red and violet were used, then green, then yellow, and then blue. Homer's color-

vision was of the degree just preceding total color-blindness. The description of the rainbow as having from one to seven colors is very characteristic, and these facts show that color blindness is only an example of an earlier state in the development of the color-perceiving centres.

Mr. J. F. BULLAR described a case of **membranous conjunctivitis in an infant,** who was born on Oct. 28, 1900, and who was quite well on Nov. 5th. On Nov. 7th the right eye was noticed to be affected and was treated by the nurse until the 11th, when it became worse and the doctor was called in. When Mr. Bullar first saw the child, the lids were very much swollen, a yellowish membrane was present, which stripped off easily and left a slightly bleeding surface. Nitrate of silver gr. 2 to the oz. was used. The eye got better, the chemosis subsided, leaving a small central ulcer of the cornea. Membrane was also noticed on the right side of the nose and fauces, which extended. The child died in convulsions on Nov. 20th. There was no diphtheria in the neighborhood, and the membrane was not examined.

Mr. SYDNEY STEPHENSON said he made it a rule to use antitoxin on first seeing a case, without waiting to verify the diagnosis bacteriologically.

The PRESIDENT said that Mr. Tweedy, who had had great experience in these cases, looked upon quinine as being a specific in diphtheritic conjunctivitis, and he had himself seen great benefit arising therefrom.

Mr. LANG said that Mr. Tweedy's observations had been made long before antitoxin was known, and he thought it should not go forth as the opinion of the Society that his view was still held.

Mr. DEVEREUX MARSHALL said he should not think of waiting to conduct a bacteriological examination (though this would not take long), but in a case of supposed diphtheritic conjunctivitis he should at once inject antitoxin, which in no case would do harm, and in a true case the sooner it was done the better. With regard to the local application of quinine, he strongly approved of it, though he had not seen its use followed by such excellent results as those obtained by Mr. Tweedy.

Major H. HERBERT, I.M.S., described a case of **hypertrophy and ossification of the tarsus.**

The patient was a male Hindu, aged thirty-three, who had considerable enlargement of both upper tarsi, which on one side was fibrous, and on the other there was considerable bony formation.

A piece of necrosed bone, which was exposed on the ocular surface of the lid, was keeping up a conjunctivitis which caused the patient to apply for relief.

His other paper was a note on the **normal surface of the cornea.** Over thirty which he had examined in Bombay showed more or less epithelial defect when the surface was partially dried by exposure. In some only two or three small pits were seen, in others there were closely set pits and grooves and sometimes more or less depressed patches. The floors had an irregular surface presented by the deeper epithelial cells. The instillation of cocaine caused on drying an extensive exfoliation of epithelium.

Judging from the corneæ inspected, slight conjunctivitis and localized keratitis tended to exaggerate these physiological defects. In superficial punctate keratitis some of the points stained with fluorescin and appeared depressed on drying, and had to be distinguished from the physiological pits above described, and which were possibly to be seen on the same cornea.

Mr. T. PRIDGIN TEALE read a paper on **peritomy in episcleritis, iritis, herpes ophthalmicus, and purulent ophthalmia.**

He traced the evolution of this operation from the older one of syndectomy, which was introduced by Furnari of Paris for the treatment of interstitial keratitis and vascular ulcers.

It was discovered that the sacrifice of a large ring of conjunctiva was unnecessary; then peritomy came to be substituted for it.

By this is meant the cutting of the conjunctiva immediately around the cornea, and if this is insufficient it can be increased by making three or four radial incisions in the membrane. The author fully indorsed its value in interstitial keratitis, and he wished further to prove its value in the other diseases mentioned above.

In episcleritis, a most painful and intractable affection, he had performed it with great benefit, and recovery was greatly hastened by its use. In iritis from any cause similar effects were noted, and the cases rapidly improved. In a case of herpes ophthalmicus and in another one of severe subacute purulent ophthalmia, the greatest benefit resulted.

As an example of its utility in a case of high tension, he related a case of irido-cyclitis with glaucoma, in which there were

special reasons for not doing iridectomy. In this the operation was followed by reduction of tension and much relief, and although it did not cure the disease, yet it much retarded it, and the result was very satisfactory.

The PRESIDENT referred to the operation as done by his father and himself, in which a very narrow piece of conjunctiva was removed. He had never seen a bad result follow.

Mr. CARTWRIGHT thought that the good results were far more due to counter-irritation than to the mechanical effect of the operation.

Mr. SECKER WALKER thought highly of it in interstitial keratitis, and had also tried it in some cases of iritis. He considered that it acted in much the same manner as a leech, only much more powerfully.

Mr. HERN said he removed a piece of tissue, and then curetted round the cornea. He looked upon it as a very valuable operation, and one that was much neglected.

Remarks were also made by Messrs. GUNN, JOHNSON, TAYLOR, and CROPPER.

REPORT OF THE OPHTHALMOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE, MARCH 18 AND APRIL 15, 1901.

By Dr. HENRY H. TYSON, Secretary.

THE CHAIRMAN, DR. JOHN E. WEEKS, PRESIDING.

MEETING OF MARCH 18TH.

Dr. A. Duane presented a **clinometer,** consisting of a pair of Maddox rods, one for the right eye, the other for the left eye, each revolving freely in a separate graduated frame which slid on a levelling bar. The instrument was considered useful for the following purposes: (*a*) To determine the degree of tilting of the vertical meridian in paralytic and other cases; (*b*) to ascertain the accuracy with which the patient estimated perpendicular and horizontal lines and right angles; (*c*) to ascertain if distortion was produced by cylindrical glasses; (*d*) to detect and outline paracentral scotomata and metamorphopsia; (*e*) as a test for simulation.

Dr. William M. Leszynsky presented a patient with **recurrent oculo-motor palsy,** who was twenty-nine years of age and married. She had been a sufferer from migraine since her sixth year. The first attack of palsy of the third nerve occurred at her twelfth year; the second attack when she was nineteen years of age; the third attack at twenty-two; the fourth at twenty-seven; and the fifth attack at twenty-nine (six months ago). All were associated with a typical paroxysm of migraine affecting the same side. In the earlier attacks the ocular paralysis disappeared spontaneously. The paralysis at present was confined to the superior rectus. The pupil was rigid, and there was also a pare-

sis of the internal rectus. Vision and fundi were normal. The nervous system was otherwise normal.

Dr. DUANE presented for Dr. LYNCH a case of **divergence paralysis.** The symptoms—diplopia, vertigo, and apparent movement of objects—had come on suddenly four weeks before without any assignable cause. Symptoms were marked for distance and slight or absent for near. The diagnosis was based upon the following findings: (1) convergent deviation and homonymous diplopia were present in all parts of the field of fixation, but were most marked when the eyes were directed straight to the front, and diminished considerably when the patient looked either to the right or the left. (2) The deviation and the diplopia, which were about 40° for distance, diminished progressively and regularly as the object of fixation was carried towards the eyes, until at seven inches there was binocular single vision, and at four inches complete equilibrium. (3) There was no restriction in the outward movements of either eye. These features served to differentiate the case from either a bilateral paralysis of the externi, a contracture of the interni, or a spasm of convergence. They were completely explicable on the hypothesis of a divergence paralysis. If due solely to this cause, the amount of deviation for distance would, as in this case, correspond precisely to the degree of convergence of the eyes when in equilibrium; while, if due in part to a complicating convergence excess, the deviation for distance would be proportionately less. Dr. Duane briefly reviewed the literature of the subject comprising some twenty cases, including one of his own, and touched upon the etiology, course, duration, and treatment. He called particular attention to the minor forms of the affection constituting an insufficiency rather than a paralysis of divergence. Of these he had seen a number of instances. An insufficiency of this sort may often be consecutive to a convergence excess or sometimes may induce the latter; the final result in either case being a concomitant convergent squint.

Dr. G. H. COCKS presented a case of **infection after cataract extraction.** He stated that he had performed a simple extraction. Three days later cornea was hazy, on the sixth day a yellow exudation appeared in anterior chamber, and membrane closed the pupil. Two weeks later the eye cleared. Two months after the extraction an iridotomy was performed, the membrane cut with De Wecker scissors, and good healing followed; V $\frac{20}{40}$ with correcting lens.

Dr. F. E. D'OENCH read a report of two cases of **temporary injury of the lens.**

CASE 1.—Boy, age eleven years, received a blow upon the left eye with the buckle of a strap. When seen the eyeball was injected, some blood was in the anterior chamber, and the sight was much reduced. At the posterior pole of the lens there was a circular agglomeration of dots about the diameter of a pin shank and covering an area about 3 *mm* in diameter. In three weeks they had completely disappeared and V = $\frac{20}{30}$ with + 3 D + 3c. ax. 20° t. There were no changes in the fundus.

The second case was that of a boy aged six years, who was struck on the left eye with a match shot from an air-gun. He did not complain until five days after receiving the blow, when the eye gave him much pain. On the following day the following conditions were found: eyeball was somewhat congested, the pupil was of medium width, on contraction slightly oval vertically. No changes in the fundus. At the posterior pole of the lens there was a collection of small dots gathered in the shape of a disc about 2 *mm* across and each dot about the diameter of a pin shank. The following day the eye had improved, the redness was gone, the diameter of the disc had become smaller. Two weeks later the dots had completely disappeared and the eye appeared perfectly normal once more.

It is possible that the dots bear some relation to the globules of Morgagni, though these are generally looked upon as post-mortem formations, due to the coagulation of the albumen. Becker, however, thinks that this coagulation may take place during life, but expresses no opinion as to whether such coagulations may not disappear subsequently. The difficulty of the examination of such lesions as those just reported, owing to their evanescence, makes an explanation difficult.

Dr. CALLAN mentioned two cases in which he had seen temporary opacities of the lens from penetrating injuries in young children, which had completely disappeared, and thought that that occurred very often in children.

Dr. WEEKS stated that he thought that the opacities were not in the lens, but were on the posterior capsule; and that they were produced by an exudation from the ciliary processes.

Dr. E. GRUENING presented a case of **tumor of the iris.** The patient was a boy, aged eleven years, who stated that a white spot appeared on his eye below the pupil about two months before he

called upon Dr. Gruening, which now appeared as a yellowish-red mass, situated below the pupil, involving one-fourth the iris; and the cornea was infiltrated. V $\frac{20}{60}$, field complete. Dr. Gruening was not permitted to enucleate the eye, so attempted to remove the mass, which he found very friable. Microscopical examination showed the tissue to be composed of a stroma with small round and spindle cells with capillaries, considered probably as a connective-tissue growth, and thought it was a leuko-sarcoma of the iris. He stated that only seven cases had been reported.

Dr. WOLFF stated that he had seen the case two days before it had been examined by Dr. Gruening. At that time the tumor did not reach the pupillary margin. Under atropinization maximum dilatation was obtained in all parts of iris except below. He had examined the fundus, and thought he saw a detachment of the retina anteriorily, and that the tumor started in the ciliary processes and not in the iris.

Dr. MITTENDORF mentioned a case of tumor in a tuberculous subject, similar in appearance to Dr. Gruening's case. Many oculists had advised enucleation, but the advice had not been followed. He prescribed large doses of creosote, and the appearance of the tumor improved, and in one month had diminished in size very considerably. Patient was not seen after that time, and the subsequent history was unknown.

Dr. C. S. BULL stated that as regards internal medication in doubtful cases, he thought it was the universal consensus of opinion that creosote had no specific effect upon tuberculous growths anywhere in the body; and that it simply improved the condition by its action upon the stomach. He had never seen any effect upon the eyes from the internal use of creosote.

Dr. GRUENING stated that he was in doubt at first as to whether it was tuberculous, sarcoma, or a gumma, but that there was no redness or irritation of the eye and no iritis. In tuberculous cases he had found several foci of infection. As the microscope had revealed the sarcomatous nature of the growth he had advised immediate enucleation.

Dr. C. S. BULL read a report of **cases of metastatic choroiditis,** occurring in the course of pneumonia, due to grippe. He stated that the lesion in the eye was often dependent upon a general septic condition of the system, which was often fatal, and which was always of such gravity as to overshadow the local condition.

The micro-organisms which have been found in such cases are the staphylococcus albus and aureus, and the streptococcus pyogenes. Bacterial thrombi have been demonstrated in the vessels of the uveal tract, retina, conjunctiva, ocular muscles, and orbit. The thrombosis sometimes comes from a microbic area, as in endocarditis or pneumonia; whether the obstruction occurs in a choroidal or retinal vessel can only be determined by the ophthalmoscope at the very beginning of the ocular symptoms. Later this fact can only be determined by the microscopic examination. The disease is characterized by pain in the eye and head, with intense vascular congestion, with the usual symptoms of irido-choroiditis and with rapid and total loss of sight. It may be ushered in by severe headache and vomiting, rise in temperature, and general febrile symptoms; tension is at first increased, but subsequently sinks much below normal, even when no perforation of the eyeball occurs. The course of the disease is from three to six weeks, and the prognosis is always bad, the case ending in total blindness, with a shrunken eyeball. Enucleation of these eyes is not advisable in the acute stage of suppuration, especially if the capsule of Tenon or the orbital tissue be involved, owing to the possible danger of meningitis developing from the entrance of the micrococci into the channels leading to the brain. In these cases evisceration of the eyeball will often give relief from the severe pains. He mentioned three cases previously reported by Mansilla, Milliken, and Frankel, and also three cases observed by himself. The eye lesions, as a rule, commenced from the third to the fifth day of the pneumonia, and invariably led to total loss of sight, with a soft eyeball.

Dr. WEEKS stated that the pneumococcus had also been found in cases of metastatic choroiditis, and were considered capable of producing it.

Dr. MARPLE inquired whether a tenonitis had ever complicated these cases? In pneumonia he had found the pneumococcus in a thick exudate upon the conjunctiva.

Dr. BULL had seen cases of tenonitis in grippe, but not in pneumonia, although it might occur with it.

Dr. WEEKS read a report of a case of a **cyst of the iris.** The patient, a boy, aged five years, had, in June, 1900, produced with a pocket-knife a penetrating linear wound of the cornea of the right eye, which was 7 *mm* long and extended in nearly a horizontal line across the cornea, just above the margin of the pupil.

Iris incarcerated, but not prolapsed. Wound healed readily without inflammatory reaction. St. pr. : Photophobia marked ; ciliary injection of right eye ; tension = + T. Globe slightly sensitive on palpation. A linear scar, $\frac{2}{3}$ by 7 *mm*, extends across the cornea above. Iris incarcerated. At the inner extremity of the cicatrix in the cornea, a spherical mass is found in the anterior chamber, which measures 4 *mm* in diameter, is translucent, and the walls of which are formed of iris tissue ; this mass bulges into the pupillary area. Cyst of the iris was diagnosed, and an operation was performed, the portion of the iris that was incarcerated in the cicatrix and the portion containing the cyst were removed. Rapid and satisfactory healing ensued. Lens transparent. Vision fair.

On microscopical examination of the cyst wall it was found that the cyst wall was lined with stratified epithelium ; the cyst apparently developed from epithelial cells that were carried into the iris tissue at the time of the accident.

MEETING OF APRIL 15TH.

DR. DUANE read a paper on **What methods shall be pursued in examining the eye muscles?**

ROUTINE OF EXAMINATION.

After making a cursory inspection of the patient, to detect the presence of any obvious anomaly, he uses first the screen test, and second the parallax test. If there is any noticeable deflection behind the screen, he then applies the screen test in a second way, or by binocular uncovering, to determine whether there is an habitual binocular fixation, alternating fixation, or a constant squint.

The diagnosis between the three may be conveniently formulated as follows :

(1) If in binocular uncovering but one eye moves, we have heterophoria and not squint.

(2) If both eyes move, or if, in spite of there being an evident deviation, both eyes remain steady, there is a squint.

(3) In the latter case, if when the left eye is uncovered the eyes behave in the same way as they do when the right eye is uncovered (both alike moving or both alike remaining steady, no matter which eye is uncovered), the squint is alternating.

(4) If when one eye (for instance the right) is uncovered, both eyes move, and when the other eye (in this case the left) is un-

covered both eyes remain steady, the squint is uniocular (confined in this case to the left eye).

He next employs the Maddox rod in the usual way, testing first for vertical and next for lateral deviation. He next employs the phorometer, both for distance and near vision. He then ascertains the convergence near-point, using any fine object and bringing it close to the eyes until the patient can no longer converge upon it. He then determines the prism divergence (abduction) and the prism convergence (adduction) in the usual way with prisms. Lastly, he determines the field of binocular single vision. This he does by placing the red glass before one of the patient's eyes and, standing at a distance of four feet, carries a candle in different parts of the field of fixation, noting whether the patient gets diplopia in any part of the field, how much the diplopia is, and in what direction it tends to increase; and also observing whether the excursions of the eyes, as they follow the candle, appear of normal amount or restricted.

When the patient cannot be made to recognize diplopia, and yet there is an evident deviation present, the test must be made in another way. He then measures the deviation by the screen test, first in the primary position, afterward in different portions of the field of fixation; and thus ascertains how and where the deviation increases, and whether the patient has binocular fixation everywhere.

In special cases, he employs two other accessory tests. First, he determines the declination with the Maddox rod clinometer. In default of this a Maddox rod set in a trial frame will answer as well. Second, he determines the field of fixation. In doing this he uses a perimeter, and employs as a test object two fine dots set very close together. With such an object the patient, unless fixing sharply, sees the two dots run together. If he sees them separately, it is proof that he is still fixing correctly upon them. This test object he finds more satisfactory than the small test letters generally used and more applicable, particularly in the case of children, and also with those who no longer have binocular vision. It is fairly precise, too, as the deviation shown by it, if measured with prisms, can be estimated to within two degrees. He regards the parallax test as next in point of reliability. It is usually available when the screen test is, and it is extremely precise, deflections of the smallest fraction of a degree being sharply made out.

The Maddox rod, although a useful accessory test, has not in

his hands proved as reliable or as accurate as the others. In estimating vertical deviation though, he finds the Maddox rod usually very precise.

The phorometer is also a useful accessory, but in many instances, particularly at near points, indicates an excess of deviation.

The determination of the prism divergence (abduction) he regards as a very important factor in the examination, but he cannot say as much for the relationship between the abduction and adduction, upon which some have laid so much stress. The estimate of the field of binocular single vision, if carefully made, he regards as very important. He has not been led to attach much importance to the determination of the field of fixation by the perimeter. The limits of excursion for each eye, when examined separately, vary considerably even in the same patient.

APPLICATION OF THE TESTS IN OPERATION.

It is his invariable practice to test a patient carefully, not only just before an operation, but also repeatedly during its performance and immediately after its close. For this purpose he usually relies upon the screen and the parallax tests ; at times he also uses the Maddox rod. If a patient shows diplopia he measures its amount, but the measurement of the diplopia affords much less certain results than the test by screen and parallax. These latter tests require no apparatus beyond a few prisms, and even these may be dispensed with except toward the close of an operation when one wishes his measurements to be quite precise. Furthermore, they can be applied in a moment and without changing the position of the patient, and they are not confusing to him, so that there is not as likely to be an error owing to his misinterpretation or misstatement of what he sees.

He usually stops two or three times at least during the course of an operation to make these tests and ascertain by them whether he has gone far enough. If not, he continues, gauging the extent of his next step by the result of the test last made, and pauses only when actual measurement shows him either that he has attained just the effect that he desired to secure or that he has gone as far as safety will allow. He stated that this method of operating was tedious, but that it certainly afforded him satisfactory results and was safe.

Dr. THOS. R. POOLEY read a paper on **tenotomy: forms of operation, when indicated.**

He stated that the operations on the muscles were intended to move the insertion of the muscle either backwards or forwards and were called respectively tenotomy and advancement. In his remarks he confined himself to the former. Before operating upon the eye he makes an examination during which he notes the following details:

1. The duration and kind of strabismus: whether convergent, divergent, etc., unilateral or alternating, constant or periodical, concomitant or paralytic.

2. A history of duration and previous operations.

3. Examination of media and fundus of both eyes.

4. Functional examination of both eyes: vision, field, refraction, positive and negative binocular vision.

5. Degree of strabismus, linear and angular, measured by strabometer, perimeter, candle, or other test.

6. Power of the muscles in every direction of the field of fixation.

7. Movements of the near point of convergence—*i. e.*, the crossing point of the visual axes, when the object of fixation is approached or carried away from the eye.

8. The habitual position of the head, especially the turning of the same to the side of the antagonist.

9. Protrusion of the eye and enlargement of the palpebral fissure.

OPERATIONS.

These should always be done if possible without the aid of an anæsthetic. The operation is very short, not very painful, and in the majority of cases can be practised even upon children by the use of a local anæsthetic. He uses a four-per-cent. solution of cocaine instilled over the region of the operation from three to five minutes before operating. He has also found it of decided advantage to drop one or two drops of the solution in the other eye. As to aseptics he uses only boracic acid, except that the solution of cocaine contains a 1:10,000 bichloride, and the usual thorough sterilization of his instruments.

The following four methods are those which he has occasionally employed with good results, but he has abandoned all other procedures in ordinary tenotomies except that which is known as the subconjunctival method.

1. Arlt's method : The conjunctiva is grasped with fixation forceps in front of the insertion of the tendon, one branch above, the other below, raised in a fold, incised with scissors so as to make an aperture of from 6 to 7 *mm*. The branches of the forceps, now closed, moved to 2–3 *mm* over the tendon backward toward the incision, then opened 7–8 *mm* vertically to the sclerotic, to grasp and raise the tendon near its insertion. The tendon is divided with the scissors from one end to the other and as near to the sclerotic as possible. A squint hook passed under the detached tendon should pass unresisted over its insertion.

2. Von Graefe's method : This may be called extraconjunctival operation. The conjunctiva is incised between the cornea and the insertion of the tendon, dissected backward and downward beyond the lower border of the tendon ; a strabismus hook is then introduced between the conjunctiva and the sclera, its top downward, and is turned in such a way as to push the tip of the hook under the muscle until it comes above its upper border ; the conjunctiva is then pushed out of the way from below upward, beyond the tip of the hook which projects above the upper border of the tendon. The tendon thus fully exposed is raised on the hook and cut with the scissors close to the sclerotic.

3. Critchett's, or the subconjunctival method : This method, which he first saw practised in Dr. Knapp's clinic, is the one which he now almost uniformly adheres to, and which he describes as follows :

If the patient is not under the influence of an anæsthetic, he is directed to look outwards. If he is, then the eye should be drawn directly downwards, a pair of fixation forceps with a catch is pressed closed on the conjunctiva just below the insertion of the tendon, the forceps are opened vertically 4 or 5 *mm*, and immediately under continued pressure closed again so as to raise a small fold which ought to contain not only the conjunctiva but also the subconjunctival tissue and Tenon's capsule. This fold is then divided with strabismus scissors by two cuts, the first dividing the conjunctiva, the second, Tenon's capsule.

He prefers scissors with a rivet on the side because they admit of closer approximation of the blades, and the rivet in this position affords a convenient place to rest the index finger while cutting. The scissors should not be withdrawn between the first and second cuts, but simply reopened and pushed farther on. If the blades of the scissors are separated, on removing them Tenon's

capsule should now be seen as a sickle-shaped membrane over the sclerotic. The scissors should not be carried too deeply, lest the opening be made too large and orbital fat protrude. If Tenon's capsule has not been thus opened it will be necessary to seize the subconjunctival tissue again with the forceps and divide it, as it is all-important for a nice performance of the operation to enter this structure before proceeding farther. The conjunctival flap now being held apart with the forceps, a squint hook is introduced into the opening of conjunctiva and Tenon's capsule, its point being directed to the lower edge of the muscle, kept against the sclerotic, rotated, and carried beneath the tendon as close to its insertion as possible, then pushed upwards until the whole, or greater part, of the tendon is caught upon it. Sometimes, however, the tendon may be more easily reached by passing the point of the hook directly under it. The forceps are removed, the tendon raised with the hook, the point of which should not be directly upwards and outwards but rather upwards and inwards, or it may perforate the fibres of the tendon and consequently only a few of them are caught up. The muscle having been thus secured, the handle of the instrument is carried inward across the nose so as to put the tendon on the stretch, the points of the scissors slightly opened one behind the other in front of the tendon, which is divided close to the sclerotic in two or more cuts, during which the scissors need not be removed. If the hook passes quite freely to the corneal margin without encountering any resistance everything is cut; if it does not, the fibres preventing it should be divided. The search for undivided fibres should be thorough, for sometimes the lateral expansion of the fibres is very considerable, and if a single one remains uncut it may defeat the whole operation.

The wound should be closed with suture according to the indications referred to hereafter.

4. Snellen's Method: In this operation the conjunctiva and tendon are pierced near the centre of the insertion of the latter and then the tendon is detached upwards and downwards. This method has been introduced in this country mainly by Dr. G. T. Stevens, who has devised a scissors well adapted to its performance.

In describing the foregoing methods, it has been assumed that in each case the tenotomy is made for a case of simple convergent strabismus. Tenotomy of the externus is done in the same way,

only we have to bear in mind that the tendon insertion is 7 *mm* behind the corneal margin, and in tenotomy of the vertical muscles, not only the difference in distance at which the conjunctiva is to be incised, but also the difference in direction of the tendon.

EXAMINATION OF THE EYE DIRECTLY AFTER THE OPERATION.

Inasmuch as the mere performance of the tenotomy does not secure success we must now carefully consider as of as much if not more importance the procedures to diminish and increase the effect. An examination of the eye immediately after the tenotomy is necessary, therefore, to determine whether the effect is satisfactory. If an anæsthetic has been used we must wait until its effect has passed off. In other cases we may make it at once, but it is better to wait for the patient to recover himself. The first point to determine is how much the deviation has been reduced. This is stated by Knapp to be between 3 and 5 *mm* for the internal rectus, and the external rectus, 2½ to 3 *mm*, while the effect upon the inferior and superior is 2½ to 4 *mm*. Linear measurements are accurate enough tests in determining this point in simple tenotomy, but in insufficiency the immediate effect commonly differs from the later point, which is always to be borne in mind. After tenotomy of the internus the immediate effect is apt to diminish and then increase greatly for weeks, months, or years, so that a case which seems to give a perfect result immediately after the operation may in future years show divergence. This statement must, it seems to me, be borne out in the experience of all who have made squint operations. A golden rule, which he learned early from Dr. Knapp, is that no squint operation should weaken the muscle beyond its physiological limit of power.

After tenotomy of the internal rectus an immediate examination should give the following results: (1) In adduction, the medial corneal margin should reach the lachrymal point. (2) The near point of binocular fixation should be at about 5 *cm*. (3) The eyeball should not protrude. (4) There should be slight convergence left. A failure to record any of these four points is likely to cause subsequent divergence and should lead us to control the effect of the operation so as to secure correct position and motility. If none of these is wrong, the wound is to be closed with a simple conjunctival suture.

In many cases no fault can be detected in these points and yet

the patient still squints. If the deviation is about 2½ *mm*, or less, we may at once reduce it, but if it is sufficiently large to warrant an operation on the other rectus internus it should be done later. The immediate effect of a tenotomy of the rectus externus increases for a few days, then gradually diminishes and at times disappears altogether.

As to the immediate effects of tenotomy on the inferior and superior recti, he has had but little experience to fall back upon, as his operations on these muscles have been very limited. He stated, however, that Dr. Knapp considered that the immediate effects on them are that the tenotomy of the superior increases sometimes considerably during the succeeding days and weeks and then diminishes, but not so much as the externus, and in some cases diminishes altogether. In the inferior it is greater than that of the externus, then diminished again, yet with it, as with the superior, considerable effect remains permanently,—smaller, however, than that of the external rectus.

The examination of the position of these muscles immediately after tenotomy is equally important as in the case of the internal rectus and should be conducted on the same line.

MEANS OF DIMINISHING EFFECT IMMEDIATELY AFTER OPERATION.

To diminish the immediate operative effect, sutures variously applied are both reliable and satisfactory. If we merely stitch the edges of the conjunctival wound we produce no influence on the effect, but by applying the suture in different ways we can produce any degree of diminution and even annul it. Sutures designed to produce much effect should have a firm hold on the corneal side of the wound, that is, they should pass through the episcleral tissue or even the insertion of the tendon. The other end of the suture should go through the muscle or tendon as well as the conjunctiva. Upon the extent to which this suture is applied depends the amount of correction to be made, which will be inferred without going into the minutiæ of the methods of doing it. It is important in all these attempts to leave some convergence. If in later examinations the effect is too much, we can remove the suture or leave it longer, or even if the convergence seems still too much after cutting the suture, we may gently loosen up the attachment of the tendon with a squint hook gradually until the position and motility of the eye are satisfactory. Knapp has applied more than one correcting suture to draw forward the tendon

and Tenon's capsule which had been set back too much, or if the restraining suture had been cut too soon, re-applied it a day or two later. He says from sufficient experience in this line he can say that during the first week after the operation the connection of the tendon with the sclerotic is loose enough for these procedures to be done without causing reaction. In his own experience such late procedures have not been necessary. He restricts all his efforts in such directions to the period immediately after the operation.

PROCEDURES TO INCREASE THE OPERATIVE EFFECT.

1. Extension of the wound both upwards and downwards. This ought to be done with great care.

2. Application of a suture in the conjunctiva over the antagonistic muscle (Von Graefe).

3. Drawing the eyeball to the other side by a suture passed through the conjunctiva and episcleral tissue, the well-known method of Knapp.

4. The method described by Jocqs, in which he unites the conjunctiva of the eyeball (of which he takes up two folds near the cornea with a double-armed thread) with the conjunctiva and subconjunctival tissues of the lid near the external canthus by passing needles through it; with this suture he can draw the eyeball outwards.

He then described the methods of operating used by Von Hasner, Panas, and Dr. Gruening. He stated that he was not a believer in partial tenotomies.

INDICATIONS.

In concomitant squint of low degree, he considered the single simple tenotomy strictly limited to the tendon of one eye as the best operation, whether the strabismus be constant or alternating. In medium and high degrees, a double simple tenotomy first upon one eye and then later, according to the indications, upon the other is indicated and will give as good results as the simple tenotomy in the low degrees. He has obtained such excellent results from the foregoing methods of operations that in considering advancement operations, which have been so much dwelt upon of late years in concomitant squint, he has not felt it necessary to adopt them in the interest of his patients. In divergent strabismus, no matter what the degree thereof, a single simple tenotomy hardly ever suffices to produce a good result. In fact the same may be said of

the double tenotomy. Here you have to consider between the advancement and the operation recommended by Dr. Gruening, with which he has obtained excellent results.

In cases of inveterate unilateral convergent strabismus, where the fixing eye has good vision and good abduction and the other is amblyopic and shows excessive convergence with diminution of abduction, a single large tenotomy sometimes suffices. An advancement of the external rectus on the squinting eye alone is preferable to tenotomy alone.

In insufficiency (heterophoria) the following should, in his judgment, be the indications which will justify tenotomy.

1. We must carefully study the power of the muscle's abduction, adduction, sursumduction, and deosursumduction. We must also ascertain the near point of binocular fixation, which together with the abduction determines the range or amplitude of convergence (abduction 7 deg., sursumduction 2 or 3 deg., adduction so variable that from 12 deg. at first it can be brought by further trial to 30 or 40 deg.).

2. Before we decide upon an operation on any case of heterophoria we should ascertain by prolonged trial what benefit can be derived from the correction of ametropia and prismatic glasses. A good indication as to the propriety of operation is when spherical and cylindrical glasses do not help any but prisms do; still further, if weak prisms before each eye make the patient comfortable we may refrain from operation, where if stronger prisms are required to give relief surgical procedure would be preferable. Under such conditions he has performed the operation for heterophoria in appropriate cases. He does not do the operation, however, according to Snellen, as recommended by some, but by the usual subconjunctival operation with careful graduation of the effect, as described in the simple tenotomy for convergent strabismus. But even under such restrictions he is forced to confess that while some good and gratifying results were obtained, others—perhaps an equal number or greater—were very disappointing. Relief is afforded for a time, but soon the symptoms return. He is forced therefore to the conviction that it is not alone that heterophoria is to be considered as an affection of the muscle but rather one of faulty innervation, as most of these cases are observed in neurasthenics, and that the restoration of the muscular eye balance alone will not suffice for a cure, which suggests, too, that all such cases should be carefully examined by not only the ophthalmologist but by other physicians as to local and general causes.

OPERATION IN PARALYTIC SQUINT.

We all know that in paralytic squint with diplopia an operation will do more harm than good. It may lessen the disfigurement, but the diplopia will be more distressing because of the approximation of the two images. He speaks now only of tenotomies and not of advancements. Knapp states that "if the paralysis though chronic is amenable to treatment or is spontaneously improving such improvement may be favorably influenced by a tenotomy, but if the resistance is diminished the cutting of the paralytic muscle leaves a more telling effect upon the motility of the eye. The paralytic muscle will be less exhausted by its work and will gain strength by the exercise which it is now capable of having."

As to the proper time to perform the squint operation, he finds that this should be done as soon after the squint has become absolute, as possible, even during the early period of life. Of course, we must exclude paralysis and cerebral disease. He believes that by thus doing we place the child in the most favorable condition for obtaining the proper functional development for its eyes, and he does not consider that anything can be done by the use of glasses except in the formative stage.

He emphasized what he had already referred to, that both eyes should not be operated upon at the same time unless in strabismus convergence there is some special reason for so doing.

Dr. FRANCIS VALK read a paper on **advancement: forms of operation and when indicated.** He first considered the operation in its various forms and also the indications for the operation selected, in the many conditions of muscular imbalance, from that of simple latent squint to that of the most extreme fixed squint, either convergent, divergent, or vertical, or the so-called paresis of divergence.

Advancement proper means the changing or bringing forward the insertion of the tendon of one of the straight muscles of the eye, from its normal position of attachment to the eyeball to another in the same plane but nearer to the cornea. But, in his opinion, as the same effect may be obtained by shortening the muscular band, at its insertion into the sclera, he included the operation of shortening under the general term of advancement. He then described the methods used by Critchett, Prince, and Schweigger. As to the operation for latent squint, he stated that Stevens had suggested a very neat and delicate advancement of

the tendon by having it fastened in a pocket under the conjunctiva. This was an operation that may be very useful in heterophoria but in an advancement for fixed squint we can hardly gain sufficient effect.

He then described the operation of shortening, an operation which in his hands had accomplished the best and most satisfactory results in nearly all cases, which is similar to the one used by Savage, except that he used the catgut suture, while Savage recommended the use of silk, with a different mode of putting in the suture, by which he thought he could fairly claim some originality in the operation.

As to the power of the different muscles, he laid great stress upon determining the fusion force of the muscles with prisms, etc., and supplements this with other muscle tests, such as with the phorometer, Maddox rod, the red glass, and the tropometer.

He then stated the power of fusion of the different muscles. In esophoria we find adduction too high, with decidedly weak abduction, as low as two degrees, and possibly crossed diplopia with the red glass; in exophoria, we find abduction very high or adduction very low, even less than abduction, and stated that the indications were very clear that we must render the weak muscles more powerful to act and so improve the fusion force of the eyes. Then in latent vertical tendencies we frequently find the superior of the one eye so much more powerful than its fellow of the other eye. If this condition should be slight, you may simply need prisms with the proper glasses, but if pronounced, you will be pleased with the result of a shortening of the weak superior rectus. Furthermore, you may find a decided tendency for both eyes to turn upward or downward, as shown by the prism test, and again the indications point to an operation that will increase the muscular power. All these indications show us very clearly that an advancement is needed, or, as he prefers it, a shortening.

Now, in reference to the effects of our operations: What will they be? If we have diplopia, either crossed or homonymous, of about twenty or thirty degrees, then he stated that an advancement, either by the old operation or by Prince's single suture would be clearly indicated, but if the diplopia shows only ten or fifteen degrees then a shortening would meet all the indications. If we have no diplopia, but a manifest tendency to an imbalance, either vertical or lateral, then, with good vision and the guiding sensation active, we may shorten the weak muscle fearlessly, inas-

much as the fusion power will adjust the eyes to the new conditions; only remember to limit the extent of your tuck to that of the imbalance.

To take advantage of this fusion force he never uses a bandage after the operation, except to protect them from any infection, and allows them to use the eyes while the absorption of the suture and the healing proceed.

In convergent squint, with congenital amblyopia, the indications are to shorten the externus, with a tenotomy on the internus of the amblyopic eye, for the cosmetic effect alone, as in this class of cases he does not expect to attain binocular vision at any time. On the other hand, if we have a squint of the second class—with good vision in both eyes—he would not do the operation for shortening unless the muscular power of the externus was shown to be weak by the examination with the tropometer. In cases of extreme convergent or divergent excess, after a too free tenotomy he would advance the tendon at the first operation, as he does not think the operation of shortening will have sufficient effect in changing the position of the visual lines.

From his past experience with the operations of advancement and that of shortening, the indications depend on one of degree, in reference to the change in the position of the visual line, the power of the weak muscle, and that of the imbalance of the muscular apparatus, as shown by the tropometer and the tests of duction by the prisms.

He considers that an advancement is fully indicated when we have a deviation of the visual line of more than thirty degrees of the arc.

That shortening is indicated in all cases of squint, if not too great, less than thirty degrees, combined with a tenotomy of the opposing muscle if necessary.

That in all cases of imbalance—without any deviation of the visual lines—the operation of shortening the weak muscle, thereby improving its power to turn the eye under the stimulation of the fusion force, has been the best in his hands, as he has fully proved its application and usefulness.

That the operation of shortening is also indicated in cases of paresis and the so-called paresis of divergence, in which we have a latent insufficiency of the muscular power that frequently becomes manifest when they are about forty years of age and presbyopia with hyperopia is present.

That in all cases of heterophoria or latent squint, either lateral or vertical, the best results will always be obtained by the operation of shortening, without any fear of an over-correction, as long as the guiding sensation of the eyes is free to act on the cerebral centres, as the process of healing takes place.

Dr. R. H. DERBY read a paper on **results of operations on the eye muscles and how to perform them.**

He stated that whatever the method of operation adopted in any case of strabismus, the result both cosmetic and visual may and generally does depend very largely upon what we may designate as the orthoptic treatment. Probably no ophthalmic surgeon would undertake the surgical care of a case of strabismus without a full and accurate knowledge of the refraction and the acuity of vision of the strabismic eye. It may be that before the tenotomy an effort has been made to relieve the strabismus by the use of glasses, or that after the operation itself a greater effect has been sought by properly adjusted lenses. So far as he has been able to observe, it is not the practice of many at least of our ophthalmic surgeons, to avail themselves of methods of ocular exercises which practised before the operation tend greatly to add to its success, and which carried out after the operation materially increase its effect. The strabismic eye is often amblyopic, but as is now well-known in many cases the amblyopia is such that patient treatment, especially when the subject is a child, can do much to ameliorate the condition.

The amblyopia in cases of monolateral squint has been described under at least three different forms. In the first, the acuity of vision is diminished, but there is no change in the conductibility of the retinal elements. The condition is one of dulness of the retina.

Again, there is a form of amblyopia where the power of fixation is impaired. The patient makes tentative movement with the macula, which seems to be losing its predominance over neighboring portions of the retina.

In the third form the inner half of the retina has better vision than the fovea.

In the first form it is common enough to have an improvement of the vision after the tenotomy. In the second form the improvement is not immediate, but comes gradually. In the last form the chances of improvement of vision are small.

It is in the second category of amblyopia, and especially in the

case of young children that results can be secured by treatment. Of the first importance is the complete correction of the refractive error. While in practice he has learned to depend largely upon the ophthalmoscope, the ophthalmometer and the case of glasses in estimating the refraction, it is not so with the strabismic child. Nothing less than repeated and complete atropinization is safe here. The ametropia once corrected, the isolated training of the amblyopic eye should be begun. To this end the closely fitting screen over the well eye, and for a half hour at a time daily, and in some cases twice in the day, the deviating eye is to be exercised. Exercises in reading, in writing, under these conditions are to be insisted upon.

A most important step in the orthoptic training of the strabismic eye is the effort to revive in the patient a desire for binocular vision, and thus recall to the eye its faulty position. The use of the red glass before one eye will in some cases provoke diplopia, or a prism with its base up or down before one eye will often cause double vision. It is, however, especially the stereoscope that develops the desire for binocular vision. It is the fusion of the double image in every direction of the axis of vision that is the absolute cure of the strabismus.

It is perhaps needless to say that in using the stereoscope we are not concerned alone with the convergence of the eyes but with the accommodation as well, and as the strabismus itself consists in an alteration of the relations between accommodation and convergence we must first correct the ametropia.

The stereoscope that he uses permits the placing the half-pictures at any point that may be required to meet the faulty position of the strabismic eye. If this eye has a visual acuity of less than two-tenths, it may well be that but one half-picture at first is seen, or, if seen at all, that it soon disappears. With children his practice is to use the familiar cards "jockey" and "horse." According to the position of the eye, the horse is perhaps seen, and for an instant its rider. The jockey is perhaps on the tail of the horse or on his neck, and the half-pictures must either be approximated or separated to meet the faulty convergence or divergence of the visual axis of the deviating eye. This stereoscopic exercise is to be followed daily, and the actual lateral distance of the half-pictures from the median line noted. Together hand in hand, with this exercise, should the monocular exercise of the amblyopic eye be continued.

It will be said that it is difficult to make a patient take any interest in the training of an amblyopic eye when the vision of the other is good, and there are no asthenopic symptoms that do not disappear when the refraction is corrected. This may be true, and doubtless in the one-sided amblyopia of hypermetropes of sixty and over we find many who have never had any inconvenience from it. But in children long persistent training without operative interference results in restoration of binocular vision, and in others in a decided cosmetic and some visual relief.

In his *Manuel de strabisme*, Javal brings forward many such cases. This author, whose views are entitled to the highest respect, says of the amblyopia ex anopsia, that he recalls no case of a child under six years of age where central fixation had been sacrificed (p. 239, *Manuel*).

If this be true, if there is a period in child life when systematic exercise of the amblyopic eye may result in improved acuity of vision, should we not in all cases see to it that the weak organ be made strong and the infinite advantage of binocular vision be secured?

DISCUSSION.

Dr. E. GRUENING stated that Graefe advised small tenotomies in speedy assistance to obtain binocular vision; he first used partial tenotomies, but afterwards abandoned them. He also tested the refraction first and corrected any error, then operated afterwards. He thought that the sinking of the caruncle was due to the division of the conjunctiva and not to the division of the muscles. In examining the degree of strabismus he preferred Hirschberg's method.

Dr. WOOTTON stated that he tests the convergence by the convergence near-point. He prefers advancement first, but operates upon both eyes in convergent strabismus. If the patient cannot converge to within three inches of the nose, they are practically cases of insufficiency of the interni, and are apt to pass into divergence later. He prefers the advancement and not the shortening operation, as in the latter case the eye sinks back into the orbit and neutralizes the effect of the shortening.

Dr. BATES stated that he thought the tropometer is of great aid in testing the muscles and advises the use of Dr. Derby's method.

In closing the discussion, Dr. DUANE stated that he thought the screen and prism tests were more reliable than Hirschberg's linear measurement.

Dr. POOLEY stated that too great dissection of Tenon's capsule was the cause of the sinking of the caruncle.

Dr. VALK stated that he thought orthoptic treatment would not be of any benefit in cases of congenital amblyopia, but in other cases was advisable.

Dr. DERBY stated that he did not wish to stand for abandonment of tenotomy, but advised the use of orthoptic treatment, and that he considered the latter treatment applicable in certain cases only.

SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE THIRD QUARTER OF THE YEAR 1900.

(*Concluded*)

By Prof. ST. BERNHEIMER, at Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin;

with the assistance of

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Translated by Dr. Ward A. Holden.

Sections XIII.–XVIII. Reviewed by Dr. O. BRECHT, Berlin.

XIII.—LENS.

494. **Krayl.** On the extraction of senile cataract in its capsule. *Inaug. Dissert.*, Tübingen, 1900.

495. **Hoor.** On complications in cataract extraction. *Zeitschr. f. Augenheilk.*, iv., i., p. 19.

496. **Bäumler.** On the galvano-cautery in the treatment of infected wounds after cataract operations. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 480.

497. **Lissizyn.** Expulsive hemorrhage after extraction of senile cataract and the prophylaxis of this condition. *Medic. Obosrenje*, March–Apr., 1900.

498. **Salzmann.** A remarkable case of cataracta arido-siliquosa. *Inaug. Dissert.*, Erlangen, 1900.

499. **Cirincione.** New method of extraction of cataracta siliquosa. *La clin. oculista*, Jan., 1900.

500. **Eggebrecht.** Operation for cataract in both eyes. *Zeitschr. f. Veterinärkunde*, Feb., 1900, p. 1.

501. **Benoit.** The regeneration of the crystalline lens in amphibians. *Bull. de la. soc. belge d'opht.*, session of April 28, 1900.

502. **Treutler.** On the alterations in corneal curvature after cataract extraction. *Zeitschr. f. Augenheilk.*, vol. iii., 1900.

503. **De Schweinitz.** Immature cataract and its treatment. *Jour. Amer. Med. Assoc.*, Dec. 8, 1900.

504. **Weeks.** Treatment of immature cataract. *Ibid.*, Dec. 15, 1900.

505. **Callan.** Operations for secondary cataract. *Ibid.*, Oct. 13, 1900.

506. **Rogers, F. T.** Lessons learned from a first series of one hundred cataract operations. *Ibid.*, Nov. 17, 1900.

Krayl (494) reported on 49 operations for removal of the lens in its capsule, some complicated, some uncomplicated, and recommends the procedure.

Hoor (495) reports an attempt at extraction in which the lens sank down in the vitreous. Severe cyclitic irritation followed, but a month later the lens presented in the pupil and was extracted, after which the eye became quiet and vision of $\frac{6}{60}$ was obtained. He reports further a case in which there was excessive collapse of the ball in an extraction with unfavorable results.

Bäumler (496) reports two cases in which suppuration after extraction was successfully treated with the galvano-cautery and useful vision obtained. He recommends deep cauterization in proper cases.

Cirincione (499) operated for membranous cataract by introducing a sharp sickle-shaped knife and after fixing the membrane with a Bowman's needle, making two curved cuts corresponding as far as possible to the margin of the pupil. A week later the disc of membrane was removed by means of a hook entered through an incision made with a lance. Krahnstöver.

De Schweinitz (503) calls especial attention to a class of lens opacities which has been described by Risley and others as associated with changes in the choroid of a non-inflammatory character. The progress of these is sometimes apparently arrested by optical, local, and general treatment. He believes also that cataracts which appear in diabetes, nephritis, lithæmia, and arterio-sclerosis are, at times, retarded by measures suited to the patient's general condition, but that these measures never dissipate opacities already existing. The refraction, when carefully and

frequently corrected, sometimes gives surprising improvement. Mydriatics and even myotics may also improve the vision, although the former seem rather to hasten the ripening process. There is no evidence that electricity has the slightest effect, and massage, if it has any influence, tends to hasten the opacification of the lens. De Schweinitz concludes his interesting paper as follows: All lenticular opacities, except the non-progressive group, should be regarded as indications for thorough investigation of the patient from a general, as well as an ocular, standpoint and the employment of remedial agents—optical, local, medicinal —according to the findings. ALLING.

In cases of cataract complicated by diseased conditions in the interior of the eye, local and constitutional treatment may be of use in arresting the progress of the opacities of the lens, as pointed out by WEEKS (504). Attempts to stimulate the circulation, such as the use of massage, electricity, and heat, he believes to have a theoretical claim for consideration. It is emphasized, however, that no treatment can clear up opacities already existing. He does not hesitate to perform extraction when, in the development of cataract, the vision is reduced to such a degree that the individual cannot follow ordinary occupations.

ALLING.

CALLAN (505) asserts that disasters from this operation can be attributed to operating too soon or to exerting too much traction on the ciliary processes, as the result of faulty methods. The membranes must be cut and not torn. He limits himself to the use of Knapp's knife-needle when the membrane is thin and to the forceps-scissors of De Wecker in case it is tough. After discission of soft cataracts and in traumatic cases, when the capsule is thickened and more or less lens matter remains unabsorbed, the use of the De Wecker scissors gives excellent results.

ALLING.

ROGERS'S (506) cases had an average of vision 0.502, with 3 % partial success and 9 % failure. He prefers the combined extraction. Artificial ripening with iridectomy and massage was done in five cases. Wound infection and severe iritis were the principal causes of failure. He believes more importance should be paid to the general condition of the patient, as influencing the prognosis. ALLING.

XIV.—IRIS.

507. **Zimerman, Ferdinand.** Tuberculosis of the iris and erysipelas. *Zeitschr. f. Augenheilk.*, iv., 2, p. 111.

508. **Elschnig.** Changes in the iris in cases of xeroderma pigmentosum. *Beitr. zur Dennat. u. Syphilis.* Festschrift for Prof. Neumann, Vienna, 1900.

509. **De Bernardini.** Granuloma of the iris. *Ann di ottalm.*, xxix., p. 128.

510. **Vollaro.** On gumma of the ciliary body *Ibid.*, 1, 2.

511. **Schieck.** Clinical and experimental studies on the action of tuberculin upon tuberculosis of the iris. *Graefe's Archiv*, l., p. 247.

512. **Engelken.** A case of serous cyst of the iris. *Inaug. Dissert.*, Marburg, 1900.

513. **Bogusz.** On two unusual cases of irideremia. *Wiener med. Wochenschr.*, l., p. 29.

514. **Birch-Hirschfeld, A.** An unusual case of pigmentary anomaly of the iris. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 568.

515. **Schapringer.** On essential disappearance of iris pigment (heterochromia tarda). *N. Y. Med. Wochenschr.*, May, 1900.

516. **Hopf, Oscar.** On the pathology of congenital aniridia. *Inaug. Dissert.*, June, 1900.

517. **Hocquard.** A study of synechia of the iris. *Arch. d'opht.*, xx., 7, p. 337.

518. **Jackson.** Exfoliation of the anterior layer of the iris with partial opacity of the lens. *Ophth. Record*, Aug., 1900.

519. **Benson.** Congenital polycoria in both eyes. Royal Academy of Medicine in Ireland, Section of Pathology, March, 1900.

ZIMERMAN'S (507) observation was of a scrofulous young girl with severe iritis which improved very rapidly after an intercurrent attack of erysipelas. Later there was recurrence, and microscopic examination revealed the presence of tubercles. The author believes that the hyperæmia produced by the erysipelas favorably influenced the tuberculous process.

ELSCHNIG (508) observed a mottled appearance of the ciliary portion of the iris. Small, sharply outlined dark brown spots projected somewhat from the gray ground. The author regards this condition as being identical with the process occurring in the skin in xeroderma pigmentosum, viz., a peculiar atrophy or hypertrophy of the pigment cells.

DE BERNARDINI (509) reports the case of a girl of six in whose left iris a large solitary tubercle in process of degeneration was rightly diagnosed and the eye enucleated. Inoculation experiments on animals confirmed the diagnosis, although no tubercle bacilli could be found in the nodules, which had the typical structure of tubercles. KRAHNSTÖVER.

In seven cases VOLLARO (510) was able to diagnose gumma of the ciliary body and confirm his diagnosis microscopically. All the patients presented pronounced symptoms of syphilis, and in six the tertiary symptoms appeared in from six to fifteen months after infection. In three cases perforation of the ball took place. In all cases the anterior portion of the choroid, retina, and vitreous were involved, as were also the lens and posterior chamber. A plastic iritis usually precedes the affection. KRAHNSTÖVER.

SCHIECK (511) reports on the statistics of 116 eyes with tuberculosis of the iris whose histories he has collected, including five observed by himself. The disease is most frequent in the first two decades of life, the prognosis being most unfavorable in the first decade and less unfavorable the older the patient. Tuberculin injections should be tried before enucleation is resorted to.

ENGELKEN (512) reports a case of congenital cyst of the iris, which was discovered two weeks after birth, appearing then as large as a pinhead and rapidly growing. After puncture with a needle the cyst poured out its clear liquid contents and collapsed. It returned and was removed by iridectomy. The wall consisted chiefly of greatly proliferated endothelium.

BOGUSZ (513) reports two cases in which a blunt force flattened the eyeball and caused the entire iris to be forced out of the ball through a small opening.

BIRCH-HIRSCHFELD (514) describes a case in which a large spot of pigment lay on the anterior surface of a blue iris and passed over continuously into the posterior pigment layer of the iris.

JACKSON (518) reports a case in which the upper part of each iris presented an area of blue gray color, the structure of the iris stroma being especially distinct. This part had lost its anterior layer of epithelium and condensed pigment. Below and above, the anterior layer hung in shreds and flakes of yellowish brown which moved in the anterior chamber. ALLING.

The patient shown by BENSON (519) was a man aged forty. In the right eye there were, in addition to the normal pupil, eight other openings in the iris. In the left iris one extra opening existed. They were for the most part slit-like openings through which the fundus could be illuminated. The patient was suffering from chronic glaucoma.

XV.—CHOROID.

520. **Senn** and **Spirig.** On the etiology of chronic so-called idiopathic irido-choroiditis. *Corres. f. Schweizer Aertze*, xxx., No. 17, p. 530.

521. **Gragnot.** A contribution to the study of infectious cyclitis. *Thèse de Paris*, 1900.

522. **Shumway.** Diffuse punctate condition of the fundus. *Annals of Ophth.*, Oct., 1900.

523. **Randolph.** Ossification of the choroid leading to identification of the body in an insurance case. *Jour. Amer. Med. Assoc.*, Nov. 10, 1900.

SENN and SPIRIG (520) found twenty-five cases of chronic irido-choroiditis to be accompanied with chronic processes in the nose, such as atrophic rhinitis and pharyngitis. Treatment of the nasal condition improved the ocular condition, which would suggest a common etiology.

SHUMWAY (522) reports a case of a woman, thirty-five, whose entire fundus, except in the macular region, is studded with innumerable, closely aggregated, dull yellow or yellowish-white spots. Those surrounding the macular region are several times the diameter of a retinal vessel, while those at the periphery are much smaller. They are soft in outline, and do not glisten, and are not surrounded by pigment. The retinal vessels pass over them. With correction, R V = $\frac{6}{6}$, L V = $\frac{6}{7.5}$. He regards the condition as allied to "senile guttate choroiditis," except that it occurs in a comparatively young person and is not limited to the macular region. He believes the lesion to be a colloid change in the pigment cells of the retina. ALLING.

XVI.—VITREOUS.

524. **Lindenmeyer.** A contribution to the knowledge of strand-like structures in the vitreous. *Inaug. Dissert.*, Tübingen, 1900.

LINDENMEYER (524) reports on two young patients with strand-like formations passing from the optic disc. One of these the author explains as being a persistent canal of Cloquet, the other a persistent hyaloid artery with the remains of a fœtal chorio-retinitis.

XVII.—GLAUCOMA.

525. **Schnabel.** The glaucomatous atrophy of the optic nerve. *Wiener med. Wochenschr.*, Nos. 24, 25, 1900.

526. **Krukenberg.** Glaucomatous excavation of the lamina cribrosa without excavation of the disc in a case of acute inflammatory glaucoma. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., *Beilagcheft*, p. 47.

527. **De Wecker.** Glaucoma in the Orient. *Ann. d'ocul.*, cxxiv., p. 45.

528. **Ackermann.** The permanent effect of iridectomy in glaucoma. *Inaug. Dissert.*, Halle, 1900.

529. **Scalinci.** The incision of the tissues of the iris angle in hydrophthalmus. *Ann. di ottalm.*, xxix., 3.

530. **Taylor, Charles Bell.** Note on a case of acute glaucoma, the result of an operation for secondary cataract. *The Lancet*, Sept. 8, 1900.

531. **Cattaneo.** Cervical sympathectomy in the treatment of glaucoma. *Bull. d. scienze med. di Bologna*, ser. vii., vol. xi., 1900.

532. **Angelucci.** The effects of sympathectomy and its application in the treatment of glaucoma. *La riforma medica*, No. 214, 1900.

533. **Albertotti.** Remarks on ten cervical sympathectomies done on patients with glaucoma. *Ann. di ottalm.*, xxix., p. 472.

534. **Hinschelwood.** Acute glaucoma after the use of cocaine. *Ophth. Review*, Nov., 1900.

535. **Oliver.** Hemorrhagic glaucoma. *Jour. Amer. Med. Assoc.*, Dec. 8, 1900.

536. **Burghard, F. F.** Three cases in which the superior cervical ganglion of the sympathetic was removed. *Brit. Med. Jour.*, Oct. 20, 1900.

537. **Gifford, H.** Glaucoma and extensive retinal hemorrhages from homatropine. *Ophth. Record*, July, 1900.

538. **Posey, W. C.** Hemorrhagic glaucoma. *Jour. Amer. Med. Assoc.*, Dec. 8, 1900.

SCHNABEL (525) rejects the prevalent views in regard to the development of glaucomatous excavation, after having examined the eyes of a patient with chronic inflammatory glaucoma whose left eye had been operated on seven days before. In the right eye there was a glaucomatous excavation and in the left swelling of the disc. In both eyes the lamina cribrosa was in its normal position. The examination of preparations from forty-two optic nerves atrophic from glaucoma and other causes led the author to the following conclusions. The first changes in glaucoma are of an atrophic nature and begin at the boundary between the intraocular and extraocular portions of the optic nerve, in the medullated and unmedullated segments simultaneously, extend posteriorly more rapidly than anteriorly, and even reach the chiasm while the excavation is but moderate and the vision still fairly good. The intensity of the degenerative process is greatest anteriorly in the nerve, and is less marked as one passes back toward the chiasm. The connective-tissue elements are normal in fresh cases, and the inflammatory changes in old and complicated cases are essentially non-glaucomatous.

The examination of the optic nerves of two patients with glaucoma of short duration is described as follows: In front of the

lamina cribrosa the nerve fibres of certain bundles are greatly thickened, and some are broken down with large drops of a thick liquid among them. The thinned nerve fibres do not fill up the connective-tissue network entirely, and a number of empty spaces are left in the intrascleral portion of the nerve. In the extra-ocular portion, for 6 or 7 *mm* from the ball, the medullary sheaths are wholly wanting, and cavities are left. In ordinary atrophy of the nerve these spaces are filled with new tissue, and the absence of this seems to the author a characteristic of glaucomatous atrophy. The illustrations offered unfortunately are not convincing, and it seems likely that the empty spaces have arisen in the course of preparation of the specimens.

KRUKENBERG'S (526) observation concerned a woman of sixty-six, whose left eye had been enucleated six days after the onset of glaucoma. When examined microscopically the lamina cribrosa was found to be forced back, but the cavity was filled by swollen non-atrophic nerve fibres, so that the papilla projected above the level of the retina. The author believes that when the lamina cribrosa is resistant glaucoma may cause a neuritis, but with the further increase in tension an excavation is brought about.

SCALINCI (529) in 13 cases of congenital hydrophthalmus had practised incision of the chamber angle (internal sclerotomy) with good results, and he attributes its favorable effects over those of iridectomy and sclerotomy to the fact that in this operation the aqueous humor does not escape, and hence there is produced no sudden change in tension. For its execution he recommends the hook needle just suggested by De Vicentiis. In all the cases observed the tension was reduced, in most cases permanently. An existing œdema of the cornea disappeared and central vision improved. Unpleasant consequences were never experienced.

KRAHNSTÖVER.

TAYLOR (530) extracted a senile cataract and twelve days later performed discission. Four months later, the vision being poor, he removed the entire membrane with iris forceps. Three days later an acute attack of glaucoma supervened. Puncture of the sclera, allowing the escape of some drops of vitreous, led to recovery with good vision. ABELSDORFF.

CATTANEO (531) reports on two cases of glaucoma, in one of which the superior cervical ganglion of one side and in the other of both sides was extirpated after the usual methods of treatment had proved of no avail. In both cases for a time there was im-

provement; the pain ceased, the pupils became smaller, and the tension diminished. The advantages did not seem commensurate to the severity of the procedure. In the case in which the unilateral operation was done, a year later the pain, the increase in tension, the episcleral injection, and the œdema of the cornea reappeared, and psychic changes, such as feelings of anxiety, vague depression, and conditions of excitation, came on, which could not absolutely be attributed to the operation, but, according to the experience of others, was probably due to the operation.

Groenouw of Breslau advocated at the Heidelberg Congress in 1897 the use of cocaine in glaucoma, and he was supported in this advice by other surgeons. HINSCHELWOOD (534) strongly disapproves of its use and records the case of a lady, aged fifty, who consulted him for headache and defective sight. She was highly hypermetropic, but the pupils were too small to allow of the fundus being seen. Mr. Hinschelwood used a few drops of a 2 % solution of cocaine. A few hours later an attack of acute glaucoma supervened, which subsided under eserine. Three days later iridectomy was performed. The patient never, however, regained her normal acuteness of vision. The author strongly recommends the employment of holocain in cases of glaucoma to be used in conjunction with eserine. MARSHALL.

OLIVER (535) states that although the prognosis is almost invariably fatal, he has had the best results from slowly performed iridectomies under general anæsthesia. Three out of eight cases are reported saved with nearly normal vision. ALLING.

BURGHARD (536) removed the superior cervical ganglion of the sympathetic in three cases with the following results:

Case 1 was that of a woman aged sixty-three, suffering from subacute glaucoma, which had been present for three months with seven acute attacks during that time. There was intense pain and no P. L. in either eye. Tension + 1. Eserine caused no improvement. The superior cervical ganglion on both sides was removed. The pulse increased in rate at once, but there was no immediate effect on the pupils. This was followed by double ptosis, intense pain in the head and congestion of the face. Tension + 1. There was no retraction nor protrusion of the globes, and the eyes and pupils were unaffected by the operation. The patient recovered and left the hospital in thirteen days, but the net result was that the pain, although less than it was on the second day after the operation (when it exceeded anything that the patient

had previously suffered), was distinctly worse than before, and the eye condition was not in any way improved. Some weeks later the pain had resumed its normal level. The ganglia were found to be normal.

Case 2 was that of a man aged sixty-three who had recurrent epithelioma in the glands of his neck, but no eye affection, only severe pain extending from the right ear downwards to the chest and right arm. The ganglion, which was adherent to some glands, was removed. Immediately the right pupil contracted, though it reacted to a bright light. There was slight ptosis, but the intraocular tension remained unaltered. The face was flushed. Six months later the pupil remained contracted and the ptosis had greatly improved.

Case 3 was a man aged forty-four, whose superior and middle cervical ganglia were removed on the right side for "false neuromata" on them. The immediate and remote effect was marked contraction of the pupil, some ptosis, but entire absence from pain. The tension was unaffected. MARSHALL.

GIFFORD's (537) patient was twenty-one years old, female, hypermetropic. Homatropine was instilled for the purpose of determining the refraction. The same night both eyes became painful. T + 1. V = 3 ft. Under active treatment the eyes cleared and numerous hemorrhages were discovered in the retina. The attacks of glaucoma returned for a year or more whenever she stopped the use of pilocarpine. He thinks the hemorrhages might have been due to the rapid reduction of tension by energetic treatment. ALLING.

POSEY's (538) case was a man of fifty-eight who, after an attack of hemorrhagic neuro-retinitis, developed absolute glaucoma. Severe pain demanded enucleation. Microscopic examination showed evidence of considerable œdema of the cornea. The iris was atrophic and closely adherent at its base to the cornea. The anterior chamber was filled with an exudate which extended around the lens into the vitreous. The retina had been the seat of intense inflammation and was partly detached and degenerated. The optic nerve was excavated and filled in by a mass of organized lymph. The central vessels showed marked thickening of the walls and proliferation of endothelium. He concludes that, as a result of endarteritis and periarteritis of the retinal vessels, a severe inflammation occurred. Hemorrhages, lymph and round-celled exudation were followed by glaucoma. The essential lesion is vascular. ALLING.

XVIII.—SYMPATHETIC OPHTHALMIA.

539. **Blumenfeld.** A case of recovery from sympathetic ophthalmia. *Inaug. Dissert.*, Kiel, 1900.

540. **Matz.** A case of recovery from sympathetic ophthalmia. *Inaug. Dissert.*, Kiel, 1900.

541. **Grunert.** A complete anatomical examination of a case of sympathetic ophthalmia. *Klin. Monatsbl. f. Augenheilk., Beilageheft zu Zahrg.*, xxxviii., p. 1.

542. **Gasparrini.** Experimental researches on sympathetic ophthalmia. *Atti della R. Acad. dei fisiocritici*, iv., vol. 12.

In BLUMENFELD'S (539) case a boy of eight was injured with a knife. Six weeks later signs of irritation appeared and eight weeks after the injury there was well-marked sympathetic ophthalmia with redness of the disc and foci of choroiditis. Atropine and mercurial inunctions brought about recovery with useful vision.

MATZ'S (540) case was that of a man whose right eye had been injured by a piece of iron, but enucleation was refused. When evidences of sympathetic inflammation appeared, 41 days after the injury, the patient consented to evisceration, and all irritation ceased in 9 days. A recurrence of the sympathetic inflammation came on 18 days later, which was treated with atropine and mercury. Three months later the eye was free from inflammation and had V = $\frac{8}{10}$.

GRUNERT (541) gives a detailed anatomical description of a case of sympathetic ophthalmia. The remarkable feature was the fact that the nerve of the second eye in its intracranial course was quite free from inflammation. This was found chiefly at the papilla, in the iris, and in the ciliary body, and in a less pronounced degree at particular points in the posterior portion of the retina and on the posterior surface of the cornea. The choroid, the posterior portion of the sclera, and the anterior portion of the retina were normal. The bacteriological examination was entirely negative. The case, however, was not altogether a pure one since the autopsy revealed the presence of a brain-tumor and chronic contracted kidneys.

Sections XIX.–XXII. Reviewed by DR. G. ABELSDORFF, Berlin.

XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

543. **Bock.** Extensive detachment of the retina after a shot from a mortar; spontaneous restoration of vision. *Centralbl. f. prakt. Augenheilk.*, xxiv. p. 262.

544. **Fehr.** On retinitis proliferans. *Ibid.*, p. 193.

545. **Cirincione.** The retinitis of pregnancy. *La clinica oculista*, Apr.–May, 1900.

546. **Jocqs.** Albuminuric retinitis followed by glaucoma. *Clinique Ophth.*, 1900, p. 191.

547. **Silfvast.** A case of retinitis circinata. *Finska läkeres äuskapets förhandlingar*, Sept., 1900.

548. **Inouye.** A case of typical toxic amblyopia caused by the use of santonin. *Ophth. Klinik*, 1900, No. 16.

549. **Touche.** Cerebral blindness. Loss of the topographical sense. Autopsy. *Ann. d'ocul.*, cxxiv., p. 212.

550. **Jacqueau.** Double homonymous hemianopsia. *La clin. ophth.*, 1900, No. 18.

551. **Herrnheiser.** On the question of amblyopia ex anopsia. *Wochenschr. f. Ther. u. Hyg. d. Auges*, iii., p. 41.

552. **Axenfeld.** A contribution to the subject of forgetting how to see. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., *Beilageheft*, p. 29.

Fehr (544) gives the clinical history of a woman of twenty-nine, observed by Hirschberg, who was in good health except for anæmia. An acute exudative neuroretinitis with thrombotic plugging of the inferior nasal artery developed. Notwithstanding temporary improvement, the typical picture of retinitis proliferans developed in the course of four years. The author considers this outcome remarkable, for since no hemorrhages occurred in the course of the disease this observation proves anew that hemorrhages are not the sole cause of the new formations of connective tissue in retinitis proliferans, but that the latter represent transformed exudations due probably to disease of the vessels.

Cirincione (545) describes a case of retinitis in a pregnant woman, the eye when examined microscopically showing no changes which precluded a restitutio ad integrum. He, therefore, energetically commends the production of abortion when there is a considerable disturbance of vision due to retinitis.

Krahnstöver.

Silfvast's (547) patient, a working woman of twenty-five, complained of sudden diminution of vision in her left eye. When examined 12 weeks after the first symptoms, the author found the ophthalmoscopic picture of retinitis circinata. There were no hemorrhages. The macular region was of a gray color. Beneath the girdle of spots there was a pear-shaped focus of connective tissue. The author lays particular stress upon this last, believing that it supports the statements of Fuchs and others that the affected portions may become transformed into connective tissue. The peculi-

arities of the case consist in the youth of the patient, the sudden onset of the affection, and the disturbance of color perception, green appearing as dark gray. DALÉN.

TOUCHE (549) describes in detail the findings at the autopsy of a man of sixty, who had several apoplectiform attacks with disturbances of speech, and later left hemiplegia and sudden blindness. There was myosis on both sides with the Argyll-Robertson symptom. Both eyes were deviated to the left and could be brought to the middle line only. The rectus superior and inferior in each eye were normal, the internal rectus considerably weakened, and the right externus slightly. Very interesting disturbances of memory for visual perceptions were found. Colors could be remembered perfectly, contours indistinctly, and topographical relations not at all. Later the memory for contours improved, but that for topographical relations remained poor, and the patient could not remember in their right order the streets he was accustomed to pass through every day. Besides other changes there was softening of the cortical visual centre, from which Touche concludes that the function of remembering topographical relations resides in the left fusiform lobule. BERGER.

HERRNHEISER (551) observed the following interesting case: A boy of eleven had long had R. convergent strabismus. V = fingers at 1.5 m. L. traumatic cataract. Two weeks later R V = $\frac{12}{200}$. Three months later R V = $\frac{6}{24}$. L. after extraction of the traumatic cataract, with + 10, V = $\frac{6}{9}$.

AXENFELD'S (552) patient was a girl of seven who had attended school for 2 months and then at the age of six had become blind from cataract following chronic irido-cyclitis in both eyes. In one eye the cataract was removed successfully, but the blindness of one year's duration had led to the complete loss of optic memory images. Notwithstanding the fact that she had useful vision, the girl recognized her own father by his voice only, and in a light room she was able to get about only by the sense of touch. Gradually the normal condition returned and the patient was sent to school again.

This case is of importance as regards the theory of vision, showing that within a year a child who has had good vision up to the age of six may so completely forget how to see that her condition resembles that of a patient who has been operated on after being born blind, and differs but slightly from that observed in children suffering from amaurosis after blepharospasm.

XX.—OPTIC NERVE.

553. **Magers.** On hereditary optic-nerve atrophy and hereditary choroiditis. *Inaug. Dissert.*, Jena, 1897.

554. **Ulbrich.** A case of bilateral atrophy of the optic nerve following the action of a strong electric current. *Correspondenzbl. d. Vereins deutsch. Aerzte in Reichenberg u. Umg.*, No. 8, 1900.

555. **Babinski.** On mercurial treatment in tabic optic-nerve atrophy. *Bull. de la soc. de neurologie de Paris*, July 5, 1900.

556. **Dor.** Post-neuritic atrophy of both optic nerves after mumps. *Rev. génér. d'opht.*, No. 8, 1900.

557. **Linget.** A contribution to the study of tubercles of the optic thalamus. *Thèse de Paris*, 1900.

558. **Prothon.** Optic neuritis after variola. *Bull. de la soc. des sciences méd. de Lyon*, April 11, 1900.

MAGERS (553) reports the clinical history of twin brothers, who, at the age of about sixteen, noticed a diminution of vision. Ophthalmoscopically, the retinal veins were dilated and tortuous. Two years later there was temporal pallor. The brothers of the mother had been affected similarly. In a second case a man of twenty-one had a central scotoma and optic-nerve atrophy of two years' duration. The male members of the family have suffered in the same way for three generations.

The author adds to these histories an observation of a symmetrical affection of the choroid occurring in two brothers without any demonstrable cause. The affection began between the ages of forty and fifty. In both eyes of both brothers there were collections of pigment about the macula and "a fairly broad zone of rarefaction about the disc."

ULBRICH'S (554) patient, a man of forty, touched a live wire and was thrown to the ground unconscious. After recovering consciousness he had giddiness and pain in the head. Vision failed rapidly and three days after the injury the right eye was completely blind.

When seen two weeks later, R V = o, L V = $\frac{5}{20}$, both discs pale. L red-green blindness and concentric contraction of the field. R oculomotor paresis. Thirteen days later a typical herpes zoster ophthalmicus developed on the left side.

HERRNHEISER.

XXI.—INJURIES, FOREIGN BODIES, PARASITES.

559. **Valude.** On the tolerance of the eye for foreign bodies. *Bull. de la soc. d'opht. de Paris*, July 3, 1900.

560. **Stutzer.** First aid in lime and mortar injuries of the eye. *Deutsche med. Wochenschr.*, Sept. 13, 1900.

561. **Schmidt-Rimpler.** On lime injuries of the eye. *Berl. klin. Wochenschr.*, No. 36, 1900.

562. **Türk, S.** Investigations on eye magnets. *Ibid.*, No. 41, 1900.

563. **Schmidt-Rimpler.** Seven extractions of intraocular cysticercus. *Zeitschr. f. Augenheilk.*, iv., 2, p. 93.

564. **Oliver.** A case of successful removal of pieces of steel from the vitreous chamber. *Ophth. Rec.*, Nov., 1900.

565. **Bane.** Chip of iron in eye, examination with fluoroscope negative, with sideroscope positive. Eye enucleated. Sympathetic ophthalmia sixteen days later. Recovery. Exhibition of sideroscope. *Ophth. Record*, Sept., 1900,

566. **Lukens.** Removal of foreign bodies from the eyeball. Based upon a report of eighteen cases. *Annals of Ophth.*, July, 1900.

STUTZER (560) advises laborers who have gotten lime into the eye to have a fellow laborer open the eye with both hands and wash it out with a fine stream of water.

SCHMIDT-RIMPLER (561) discusses the rules laid down by Andreae for the treatment of lime injuries. In the last 10 years 56 cases have been seen in the Goettingen clinic, mostly caused by slaking lime. In 20 cases blindness resulted. He recommends removing the particles by injecting oil with a syringe. This not only relieves the pain more quickly, but the particles are kept from dissolving farther, as they would do if water were injected. Experiments on rabbits confirmed his views.

TÜRK (562) found that when the magnet was in direct contact with a splinter of iron the strength of the Hirschberg instrument was but little less than that of the Haab; but when the splinter was some distance away the Haab was much more powerful. Türk, therefore, believes that Hirschberg's instrument is indicated when it can be approached to a distance of a few millimetres from the foreign body without injuring the vitreous, while in case the foreign body is far back in the eye the Haab magnet should be used.

SCHMIDT-RIMPLER (563) has made seven extractions of cysticerci in Goettingen in the last ten years. The cysticercus was in the vitreous in four cases, and beneath the retina in three. The operation was successful in all, but in the majority the vision was so reduced as to be of no service. In one case vision rose from $\frac{1}{12}$ to $\frac{1}{4}$. The extraction is always to the patient's advantage, since the cysticercus otherwise causes phthisis bulbi and the possibility of sympathetic ophthalmia cannot be excluded entirely.

OLIVER (564) was able to locate the steel by the defect in the field and by the X-ray. He extracted it with a magnet introduced through the original wound. The eye recovered with a small amount of vision. ALLING.

From a study of the cases admitted to the Wills Hospital during 1899, LUKENS (566) concludes that the lens is the most tolerant of a foreign body, that the phagocytic power of the healthy eye is very strong, and that skiagraphs are absolutely indispensable when a foreign body cannot be seen. Copper and stone give the most unfavorable prognosis. ALLING.

XXII.—OCULAR DISTURBANCES IN GENERAL AFFECTIONS.

567. **Wettendorfer.** On hysterical disturbances of vision. *Wiener med. Wochenschr.*, No. 31, 1900.

568. **Simek.** Ocular disturbances and hysteria. A contribution to the differential diagnosis between hysteria and epilepsy. *Zeitschr. d. tschechischen Aerzte*, Nos. 23, 24, 1900.

569. **Koenig.** Hysterical ocular syndromes simulating organic affections. *Rec. d'opht.*, No. 7, p. 397, 1900.

570. **Purtscher.** The effect on the eye of poisoning by illuminating gas. *Centralbl. f. prakt. Augenheilk*, xxiv., p. 225.

571. **Mignot.** A contribution to the study of pupillary disturbances in some mental diseases. *Thèse de Paris*, 1900.

572. **Tillier.** A case of acquired color blindness due to beri-beri. *Norsk. Magaz. for lagevidenskaben*, Sept., 1900.

573. **Piltz.** On some new pupillary symptoms in tabes. *Bull. de la soc. de neurol. de Paris*, July 5, 1900.

574. **Engelhardt.** Optic neuritis due to chlorosis; death with symptoms of brain tumor. *Münch. med. Wochenschr.*, Sept. 4, 1900.

575. **Wagner.** Ocular affections in myxœdema. *Klin. Monatsbl. f. Augenheilk.*, xxxviii., p. 473.

576. **Despagnet.** The relations between ocular and dental affections. *Rec. d'opht.*, No. 7, p. 386, 1900.

WETTENDORFER'S (567) first patient was a boy of nineteen, from whose cornea a small foreign body was removed, when, although the eye appeared normal, vision was reduced to the ability to count fingers. Under treatment by suggestion normal vision was regained. The second patient, a boy of fifteen, after emotional excitement, suffered from paralysis of accommodation, diplopia, and anæsthesia of the left half of the body. Suggestion, the faradic current being used, led to recovery.

SIMEK'S (568) patient, a girl of twenty, had frontal headaches associated with vertigo and convulsions beginning in the right hand and extending over the entire body. During the convulsions the patient lost consciousness. The diagnosis lay between epilepsy and hysteria, but was verified by an examination of the eyes. There was anæsthesia of the conjunctiva in both eyes, spasm of accommodation, and contraction of the fields for white and colors, with reversal of the color-field limits. HERRNHEISER.

PURTSCHER (570) collected four observations of poisoning by illuminating gas and added a new one of his own. A man of sixty accidentally turned on the gas in his sleeping-room and became poisoned, but was resuscitated. He remained, however, completely blind for ten days. Six weeks later Purtscher found disturbances of intelligence and difficulty of orientation, with $V = \frac{3}{12}$. In both eyes the left half of the field was wanting, and in the right eye the lower quadrant of the right half as well. The fundus was normal; the pupils responded promptly to light thrown from the right side, sluggishly to light from the left side. Gradually vision increased to $\frac{6}{9}$, but the fields remained unchanged. Purtscher supposed the visual defect to be due to a hemorrhage or a focus of softening in the optic radiation, or in the cerebral cortex.

TILLIER'S (572) patient, a seaman of twenty-four, stated that since an illness, diagnosed beri-beri, a year before, he had been unable to distinguish the signal lights. Vision and visual fields were normal and the fundus was normal. The ability to differentiate between red and green was much diminished. Blue and yellow were seen poorly, but better than red and green. The author believed that the cause was a lesion in the occipital lobe. DALÉN.

ENGELHARDT'S (574) patient, observed in the Augusta Hospital at Cologne, was a girl of eighteen with bilateral choked disc and bare perception of light. She had, further, headache, drowsiness, vertigo, and epileptiform convulsions. Besides complete anosmia there was right hemiplegia and hemianæsthesia. The number of red blood corpuscles and the amount of hæmoglobin were reduced, but on account of the symptoms a diagnosis of brain tumor was made. Nine months later the patient was blind and the nerves atrophic. The general condition grew worse, an obstinate anorexia emaciated the patient rapidly and she died after a period of restlessness alternating with somnolence. At the autopsy nothing pathological was found, save anæmia of the brain, so that the symptoms must be regarded as those of a functional neurosis dependent upon the chlorosis.

WAGNER'S (575) patient, a woman of twenty-six, suffered from myxœdema. R, neuroretinitis with $V = \frac{1}{10}$, L, optic-nerve atrophy with $V = \frac{1}{10}$. Under the administration of thyroidin the general condition improved, the neuroretinitis disappeared, and vision in the right eye became normal. The optic-nerve atrophy in the left eye, which the author believed to have no connection with the myxœdema, remained unchanged.

MISCELLANEOUS NOTES.

Exercises and Historical Exhibit at the St. Paul Meeting of the American Medical Association, June, 1901, to Commemorate the **Fiftieth Anniversary of the Invention of the Ophthalmoscope.** By Dr. HARRY FRIEDENWALD.

At the meeting of the American Medical Association in Atlantic City in 1900, the writer suggested the propriety of commemorating this important event at the meeting in 1901. The Executive Committee of the Ophthalmic Section reported favorably upon the suggestion, and a committee, composed of Dr. Casey A. Wood of Chicago and the writer, were appointed to carry out the plan.

At the meeting of the Ophthalmic Section on June 5, 1901, at St. Paul the following addresses were delivered:

I.—**The History of the Invention and the Development of the Ophthalmoscope.** By HARRY FRIEDENWALD, of Baltimore, Md.

II.—**The Life of Hermann von Helmholtz.** By CASEY A. WOOD, of Chicago, Ill.

An interesting portion of the latter address was the reading of a letter from Prof. HERMAN KNAPP in which he gave personal reminiscences of Helmholtz.

In a hall adjoining the place of meeting of the Ophthalmic Section the writer had arranged an historical exhibit of ophthalmoscopes and of ophthalmoscopic literature. The exhibit included many old and very rare instruments.

The original instrument of **Helmholtz** (1851) was shown in five models, one of which had the additional interest of having been in the possession of Albrecht von Graefe. In these the reflecting surfaces are plates of unsilvered glass.

Ruete's instrument (1852), the first practical instrument for the indirect image, was obtained through the kindness of Dr. Haskett

Derby of Boston. This is the first instrument in which a concave mirror of silvered glass was used.

Coccius's instrument (1853), made of a plane mirror with a convex spherical glass attached (which condensed the light upon the mirror), was shown in several forms.

Zehender's instrument (1854), which resembled that of Coccius excepting that the mirror was convex, was shown in two models.

The **heterocentric mirrors** were represented by three varied forms of Burrow's ophthalmoscope in which the reflector is a biconvex lens, silvered on one side, with the silvering removed at a spot in the centre. This lens acts both as reflector and as correcting lens.

Jaeger's large ophthalmoscope (1854) was represented by ten models of more or less varied form. This instrument was a modified Helmholtz, in that the reflector, made of three plates of unsilvered glass, could be removed and replaced by a concave silvered mirror as in Ruete's instrument. The former was used for the upright, the latter for the inverted image. Strawbridge's modification was likewise shown. In this instrument the Jaeger ophthalmoscope is supplied with three Rekoss discs carrying the correcting lenses.

The **stationary ophthalmoscopes** shown were the large Liebreich and the Follin. In these instruments the lens and the concave mirror are fixed upon a stand though their relative distances admit of change. The former also has a device for the fixation of the head of the patient.

Galezowski's instrument (similar to that of Hasner) was shown in several models. In this instrument the concave mirror and the lens are near the two ends of a telescopic tube, one end of which is applied to the face of the patient, the other to that of the observer.

Demonstration ophthalmoscopes were also presented in the following instruments:

(*a*) Schweigger's (similar to that of Sichel, described in Graefe-Saemisch's *Handbook*), in which part of the light returning through the opening in the mirror is deflected by a prism to a second observer.

(*b*) Graefe-Peppmueller's (two), in which a small plane mirror is placed at an angle in front of and just beside the opening in the concave mirror (as in the later device used by laryngologists), and

(*c*) Schoeler's, in which a small reflector is placed at an angle just behind the opening of the ophthalmoscope.

The simple ophthalmoscopes were represented by a "small Jaeger," a number of "small Liebreich's" (the various forms from the oldest, in which the mirror was of metal, to the modern glass mirrors were shown), two Anagnostakis's, a Nachet, several Desmarres (with two openings), and a number of pocket ophthalmoscopes.

The **binocular ophthalmoscope** appeared in a number of different forms of **Giraud-Teulon** and of **Lawrence.**

The **electric light ophthalmoscope** was presented in Schweigger's, Dennett's, and a new model of Meyrowitz.

The **refracting ophthalmoscopes** exhibited were those of:

(*a*) Loring (a complete set showing the gradual development of the instrument and including an original Wadsworth tilting mirror). (*b*) Knapp (the double disc, the large and small single disc varieties). (*c*) Burnett (modified Loring with flat and tilting mirror and adjustment for cylindric glasses). (*d*) Keyser (very small, two discs). (*e*) Harlan (two discs). (*f*) Jackson (correcting lenses in two vertical slides). (*g*) Landolt (in different forms). (*h*) Dudley. (*i*) Hirschberg. (*j*) De Wecker. (*k*) Fox. (*l*) **Parent** (with attachment for **cylindrical glasses.** (*m*) **Morton** (in which correcting lenses form a chain working in a groove). (*n*) Callan (modified Loring with Stokes constant axis cylinder. (*o*) Roth. (*p*) Knauer. (*q*) Jessop's, Howe's, and Brown-Pusey's pocket ophthalmoscopes. (*r*) One unidentified French refracting ophthalmoscope.

A large number of **skiascopic mirrors** were likewise exhibited.

ANNOUNCEMENTS.

The meeting of the American Medical Association in 1902 will be held in Saratoga Springs. JOHN A. WYETH, of New York, has been elected President of the Association, Dr. FRANK ALLPORT, of Chicago, President, and C. A. VEASEY, of Philadelphia, Secretary of the Section on Ophthalmology.

The members of the medical staff of the Wills Hospital have organized an "Ophthalmological Society of Wills Hospital." There will be two monthly meetings for presentation of patients and scientific communications.

Drs. G. E. DE SCHWEINITZ, C. A. OLIVER, H. F. HANSELL, and

J. W. Croskey, have been appointed ophthalmologists to the Philadelphia Hospital.

Dr. F. W. Harvey has been appointed Ophthalmic Surgeon to the Royal Victoria Hospital, Montreal.

Obituary.

Dr. **Frank Abbott,** the well-known oculist at the General Hospital and the Eye, Ear, and Throat Hospital of Erie County, died April 9, 1901, in Buffalo, N. Y., after a long illness.

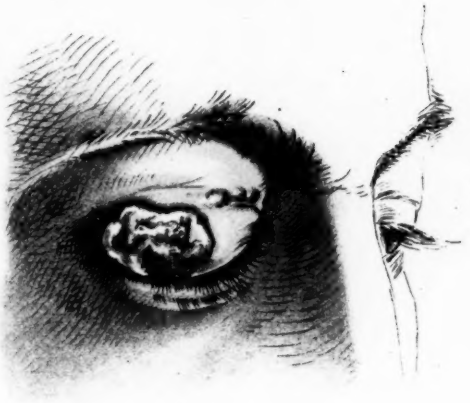

Fig. 1.

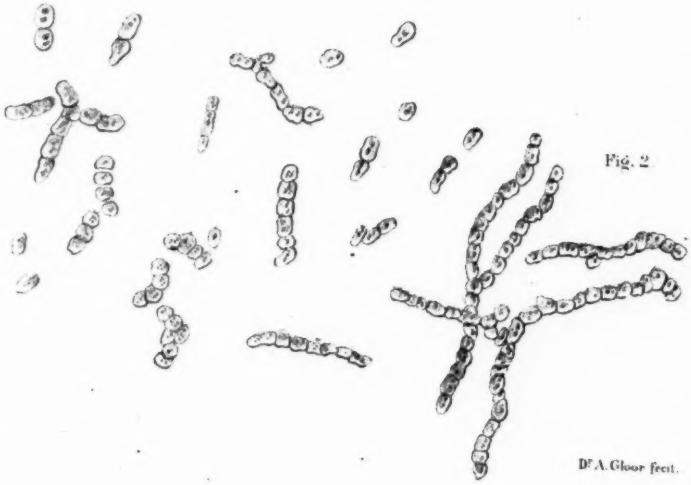

Fig. 2

Dr A. Gloor fecit.

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